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A Remarkable Fleet

The Picturesque Career of the Vessels of the Luckenbach Fleet

By David A. Wasson

THE announcement that the Luckenbach Steamship Co., of New York, is in the market for two more 10,000-ton ships to be built in American shipyards for service through the Panama canal, calls attention to a fleet of vessels whose like cannot be found elewhere under the Stars and Stripes. Its personnel has been recruited from the tonnage of no less than eight nations—England, Germany, Spain, Norway, Holland, Belgium, Austria and Hawaii.

Newest and finest of the lot is the three-year-old steel steamship Damara, of 4,987 tons. The Damara, a Britisher, was completing her maiden voyage, and had just started from San Francisco with a half-million-dollar cargo of barley for Grimsby, England, when she went ashore in a fog near Fort Point, Cal., on Oct. 8, 1910. Eleven days later four tugs and numerous lighters and wrecking pumps were the means of her floating, with $300,000 damage done to ship and cargo. Edgar F. Luckenbach bought and repaired her, and she is again in service between Panama and north Pacific ports with Old Glory over her stern.

Several of the Luckenbach fleet have made history. The iron steamer D. N. Luckenbach, 2,929 tons, was a Spanish prize captured off Key West April 23, 1898, by the flagship New York, of the Flying Squadron. She was then known as the Pedro, and was bound from Spain for Santiago with a full cargo of provisions for the Spanish forces in Cuba. Even then she had seen a good deal of the world, for she was originally the British steamer Lilburn Tower, and was built at Newcastle-on-Tyne in 1883. After the war she was renamed Hector, and plied in the coal trade for several years under the ownership of the Boston Towboat Co. before the Luckenbach Company bought her.

The 2,564-ton iron F. J. Luckenbach was another prize. She was the Spanish steamer Euskaro, and was captured in Cuban waters soon after the Pedro. She, too, had flown British colors first, having been built at Sunderland and named the Marie. Proof of the good stuff still in these battle-scarred veterans is a race which took place in August between the 31-year-old D. N. Luckenbach and the F. J. Luckenbach, of 28 years. Both, loaded with phosphate rock, sailed from Port Tampa, Fla., for Baltimore 12 hours apart, the latter in the lead. She kept it, but the D. N. reached port in four days only seven hours behind.

The Buena Ventura

A third Spanish victim of United States warships, bought by the Luckenbachs, foundered at sea a few years ago. She was the steamer Buena Ventura, first prize of the war, taken in Florida straits only a few hours before the Pedro. The Spaniard was timber-laden, bound across to the Continent, and her polite skipper, not knowing of the existence of war, dipped his colors courteously to the gunboat Nashville when she fired a shot across his bow. The Buena Ventura's engines were finally removed and she was converted into a barge, being in tow when lost. She was of iron, built at Sunderland in 1871.

The City of Washington, which is ending her days in Luckenbach service as another ignominious barge, was a Ward liner, and when the ill-fated Maine was blown up at Havana on Feb. 15, 1898, she was lying at anchor nearby. Flying debris smashed some of her boats and superstructure, but the crew rallied and received on board many of the survivors of the awful catastrophe. The Washington was originally a wooden steamer, built at Chester, Pa., in 1877.

The big steel S. V. Luckenbach also played a part in the hostilities, though a less sanguinary one. At the outbreak of the war she was the Obdam, hailing from Rotterdam, and she was bought by the government for use as a transport, being renamed McPherson. This was not her first personality, however, for she had made her debut at Belfast, Ireland, in 1880, as the steamer British Queen. After Uncle Sam got through with her, she was sold at auction and re-entered private life as the freighter Brooklyn. Her purchase and rechristening by the Luckenbach estate have been the only important episodes in her life of late, although recently a New York paper somewhat prematurely reported her as lost at sea with all on board, while on a passage from Sabine, Texas, to South Brooklyn.

Another steamer of many aliases is the big iron Harry Luckenbach, of 2,798 tons. She was built at West Hartlepool, England, in 1881, and first known as the Surrey, under British colors. A change of ownership resulted in her being renamed Michigan, and as such she passed into Norwegian hands. After getting into trouble on our shores she was bought, repaired here and Americanized under an old act of congress, as were most of the Luckenbach steamers.

One of the worst tragedies in marine annals was that in which the J. L. Luckenbach figured. She was formerly the North German Lloyd freighter Saale, though built at Glasgow in 1886. This great 4,920-ton craft was in the midst of the terrible Hoboken water-front fire of 1900, which destroyed upwards of 100 lives and burned the steamers Saale, Main, Bremen and Phoenicia. The hull of the Saale, then little more than a rusty and buckled shell, was bought by the Luckenbachs and rebuilt. The J. L. Luckenbach is one of the very few American steamers now in trade between this country and Brazil.

The Jacob Luckenbach was built for Belgian account at Sunderland, England, in 1881, being first known as the Hermann. Some years later she was sold to Norwegians and renamed the Hero. A dozen years ago she went ashore on the middle Atlantic coast, and was floated, put under the American flag and given yet another name, that of Success. But she was not destined to hold it long, for the Luckenbach interests acquired her. The Jacob is one of the few cargo steamers still in existence having the old-fashioned clipper stem, bowsprit and figurehead. She may owe her very existence to this peculiarity of build, for last April the long overhanging bow bore the brunt of a disastrous collision in Chesapeake bay with the German steamer Sigmaringen. The Jacob is an iron vessel of 2,793 tons register.

The steel steamer San Mateo, 2,906 tons, is a late addition to the fleet and began life at South Shields, England, in 1888 as the British steamer Charters Tower. She was sold to Honolulu merchants, and for a time flew the flag of that tiny nation. Upon the annexation of Hawaii by the United States in 1900 she came under American colors.

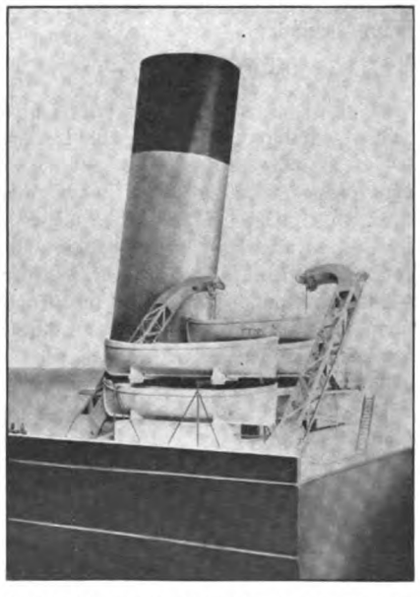
Sunk in Chesapeake bay on Jan. 3, 1913, with the loss of her captain, his wife and 13 of the crew, the Julia Luckenbach, a steel steamship of 3,100 tons, ended a decidedly varied career. She was built at Rotterdam, Holland, in 1882, and was originally the Dutch steamer Zaandam. During the second stage of her existence she was the Austrian steamer Styria, plying between Gulf ports and Fiume and Trieste. Her entry into the American merchant marine came after she had gotten into trouble on our shores, and her passing was the result of a collision with the British steamer Indrakuala.

The Lyra and Lewis Luckenbach, two of the biggest of the fleet, are American-built, as are with a few exceptions, a horde of sea-going tugs and barges, the latter mostly dismantled clipper ships. Some of these are notables.

The iron barge West Point, patriarch of the fleet, was formerly the British bark The Bruce, built at Glasgow in 1866. The Clintonia was first a British tramp steamer of the same name, built at Newcastle in 1881. The Old Dominion was an iron side-wheel steamer of the Metropolitan Line between New York and Boston, and the last of her obsolete type to ply around Cape Cod. The Washington, second of the name in the same fleet, was originally the clipper ship Manuel Llaguno. The Carrie Clark was also a full-rigged clipper, launched under that name in Waldoboro, Me., in 1874, but was sold foreign and for the best part of her life sailed as the German bark Anna. The A. G. Ropes was a fine full-rigger built at Bath in 1884. Several years ago she was dismasted by a typhoon in the far east, and the cost of renewing her expensive top hamper was too much for a wind-jammer to weather in these piping times of steam. Mr. Luckenbach bought her, sailed her 15,000 miles to New York under a jury rig, and added another worthy subject to his collection.

Derrick for Lowering Boats

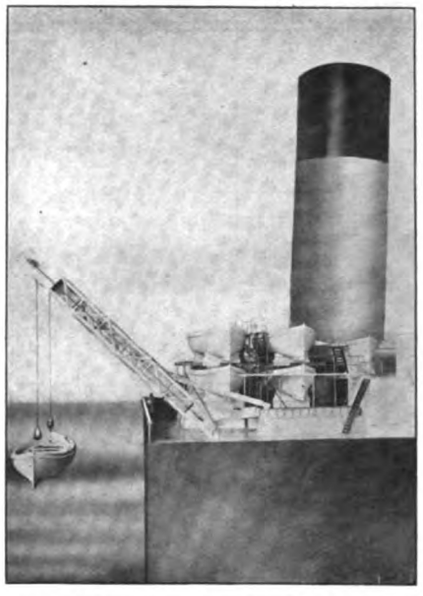
Probably no recent innovation on modern liners has received so much favorable comment from travelers and ship experts alike, as the latest form of boat-lowering gear just adopted by the White Star Line, which is to be installed for the first time on the new leviathan Britannic, now approaching completion. As will be seen from the accompanying illustrations, the usual form of davits has been discarded, and staunch and powerful derrick-like arms adopted instead. There are several splendid advantages in this new boat-handling arrangement. Here-



DERRICK COMMANDING LIFE BOATS

tofore a collision has almost always made it impossible to launch any of the boats situated on the damaged side, but with the Britannic's splendid gear, it will be possible to launch every boat the steamer carries, as the six sets of derricks are capable of reaching far enough across the vessel to handle each of the motor and lifeboats carried. It is evident that this would practically double the number of boats made available in the event of danger.

The derricks being electrically driven by special dynamos situated on the boat deck itself are absolutely independent of any other machinery on the ship and this method also assures



DERRICK LOWERING LIFE BOATS

the lowering of the boats in very much less time than was previously possible, strong points in favor of the new system. Still another advantage of the derrick gear is that passengers can take their places in the boats with the utmost safety before the boats are lifted from the vessel's deck and as the derricks are so constructed that fully-laden boats can be lowered far out from the ship's side, the risk of smashing them in bad weather is minimized.

Launch of the Caroline

The large steel steam yacht Caroline was launched April 7, at City Island, N. Y., by Robert Jacob. The yacht is being built from the designs of William Gardner & Co., No. 1 Broadway, New York, and under their supervision for Edward Ford, of Toledo, O. She will register about 400 tons, and is 188 ft. over all, with a beam of 24 ft. and 10 ft. 3 in. draught. The hull is built of high tensile steel, with two longitudinal and five athwartship bulkheads. Bilge keels are fitted. The machinery consists of two water tube boilers and one triple-expansion engine of 800 horsepower, giving a normal speed of 12 knots, or 14 knots when forced draft is used. The coal bunkers are of large capacity, giving the yacht a cruising radius of over 2,500 miles. The yacht will cost about $175,000 complete.

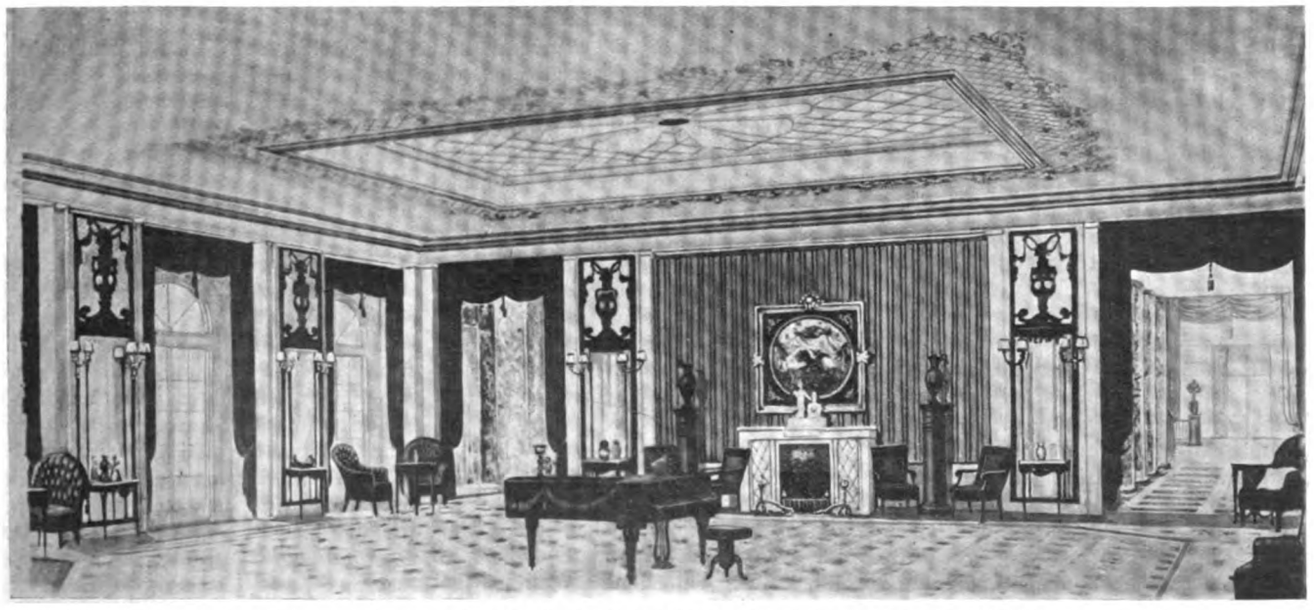
NEW STEAMSHIP COLUMBUS

THE SPLENDID DINING ROOM OF THE NORTH GERMAN LLOYD STEAMSHIP COLUMBUS

THE amazing progress that has been made in steamship construction during the last 50 years—within the memory of men hale and hearty today—is vividly illustrated in the new steamer Columbus, of the North German Lloyd, now nearing completion at the Danzig yards in Germany. In point of size the Columbus will be by far the largest of the North German Lloyd steamers—larger by 10,000 tons than the George Washington, which is at present the giant of them all. Her displacement will be 42,000 tons, with a net registered tonnage of 37,000. She will be 775 ft. in length and 83 ft. in width, with nine decks.

The grand salon of the Columbus will be designed and decorated in the Florentine Renaissance style. The wood work will be of solid mahogany. There will be a great open fireplace and natural light will flood the hall through a number of drawing room windows, extending from the ceiling to the floor. The hangings will be of heavy crimson velvet, and Oriental rugs will cover the parquet floors. The room will contain 4,860 sq. ft. of space.

The dining room, too, will be a marvel of beauty and will closely resemble the banquet hall of a great hotel. The central part of the room will be 20 ft. from floor to ceiling. On both sides there will be balconies, under which the wings of the dining room will extend. At the head of the room will be a great oil painting, with a medallion on either side. These will be illuminated by two clusters of pillar lights. The main source of artificial illumination, however, will be from a great crystal electrolier, and from groups of lights on the pillars supporting the balconies. The natural light will come through full-length windows.



THE SALON OF THE NORTH GERMAN LLOYD STEAMSHIP COLUMBUS

This great room will contain 9,140 sq. ft., and will be capable of seating all of the 536 first cabin passengers at one time.

Compare these two palatial halls to their equivalents of 50 years ago! The first trans-Atlantic liner of the North German Lloyd—or rather of its predecessor, the Ocean S. S. Navigation Co.—was the Washington, considered in its day a marine wonder. The cabins were entered from a central hall, about 10 ft. wide. This hall took the place of the dining room and salon of today. At meal time a table, running the length of the hall, was placed in position and about it the dozen first-class passengers partook of their repast. Upon its completion the table was folded up and then the "dining room" again became the "salon". The records show that on her initial trip, this Washington carried one first cabin and 93 steerage passengers!

The promenade deck of the Columbus will have a real promenade. It will extend along each side of the ship for 410 ft., so that five turns around the deck for a morning "constitutional" will represent 1 mile of walking. For those who do not care to cover this distance on foot, however, there will be electrically propelled chairs, much like those that are seen on the board walk at Atlantic City and other resorts.

The palm garden will be a veritable tropical paradise, filled with rare trees, plants and flowers from Algiers and the West Indies. There will be a Venetian Cafe and a wonderful library; a grand ball room containing 4,000 ft. of space; a gymnasium equipped with a tennis court and every device for exercising and a great children's playroom, with special nurses, where little ones can be entertained all day long.

The second cabin has its special social and dining rooms, ladies' lounge and smoking room and a majority of the cabins have but two beds. The third cabin also has its separate public rooms and its cabins are built to accommodate two and four persons.

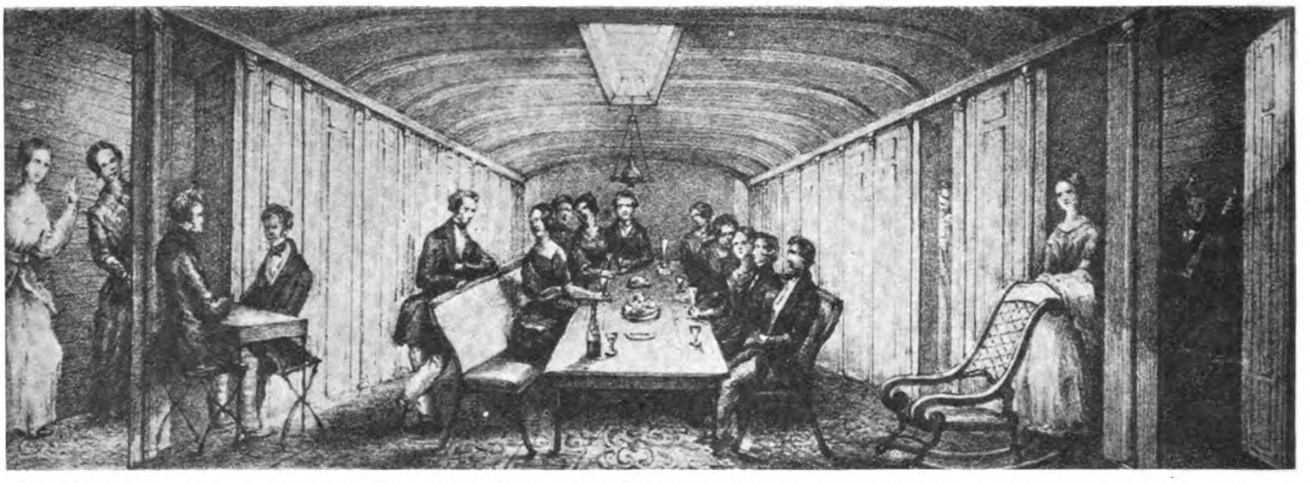
A marked innovation in steerage quarters has been provided on the Columbus. Instead of the passengers being placed in one large room, as on most ships, they will have separate cabins, arranged for families and small groups of men and women.

Second Cabin

The Columbus will make the run between Bremen and New York in eight days, or an average speed of 20 knots an hour. For navigation purposes, a Kreisel compass, a wonderful new invention, will be used. This compass always points to the true pole, instead of the magnetic pole, and is entirely independent of the earth's magnetism.

Like all North German Lloyd steamers, the Columbus will have a complete inner skin, extending far above the water line. The watertight compartments will be so arranged that even though several were flooded, the ship would still float.

The Columbus will, of course, be provided with all other safety devices, including submarine signals and sufficient lifeboats to accommodate everyone aboard. There will be several electric launches, which will be capable of towing the lifeboats. Another innovation will be a regular fire department. It is expected that the Columbus will make her initial trip the latter part of August or the first of September.



THE DINING ROOM AND SALON OF A STEAMER OF FIFTY YEARS AGO

Lack Sufficient Displacement

In a statement published in the New York Herald, Theodore E. Ferris, of New York, voiced the opinion that the larger steam yachts have insufficient displacement. This applies particularly in the case of yachts, say, 125, 150 or 175 ft. long. They lack sufficient draught, too. Another phase of most steam yachts is that the ash pit draught system is not economical. Mr. Ferris believes that steam yachts should be built more along the lines of merchant vessels. As a rule the top hamper is not substantial enough and deck houses, etc., should be of steel, not wood. There are too many flimsy skylights littered about decks, and this is bad for real heavy weather. The average steam yacht is pretty, but in a heavy sea, off shore, is most uncomfortable, if not dangerous. In smaller vessels the usual condition is that there is too much dead rise to get sufficient draught without increasing displacement. The British tendency is to develop a better type, but in a major portion of them there is little regard for stability. Steam yachts would be more comfortable, Mr. Ferris says, and far better in a heavy sea were they built more along the box section type, as used in commercial vessels, and, if necessary, top-side ballast tanks might well be used to make life easier for owners and their guests. A vast majority of present-day steam yachts, American and foreign, are far from what they might be as regards comfort and seaworthiness.

Twenty-five thousand persons were carried to Panama during the year ended Dec. 31, 1913, on vessels of the United Fruit Co.'s steamers. The army of tourists came from every city in the United States and Canada and while many sailed from New Orleans and Boston, the majority embarked at New York. During last year the United Fruit Co. increased the strength of its fleet by eight vessels, making a total of 20 first class passenger steamers and 120 cargo vessels. Six new steamers are now being built in the United Kingdom and will be placed in service by the end of the year.

Port Development at Seattle

SHIPPING WHARVES AT SEATTLE

EXCELLENT progress has been made during the past year upon the port development of Seattle under the direction of Paul Whitham, chief engineer. The east waterway project covers the improvement of an entire block of about eight acres in area on the east side of the east waterway, between Stacy and Lander streets, the original ground elevation being about 2 ft. above high tide. Through the center of this block a slip has been excavated to a depth of 49 or 50 ft. below high tide, which gives a depth of 32 or 33 ft. at extreme low tide, or about 36 ft. at ordinary low tide. This slip is 814 ft. long by 212.6 ft. wide on the bottom, with side slopes of 2.1 protected by a 3-ft. depth of rock riprap. On each side of the slip is located a one-story merchandise shed, 90 ft. wide by 745 ft. long. The easterly end of the block along Whatcom avenue is being reserved for warehouse purposes, upon which construction work has not yet been started.

The excavation and slope protection work was completed in October, and the main contract for the construction of the two merchandise sheds was completed in December. At the end of the year, work had been begun and will be completed early in 1914 on the plumbing, electric wiring and automatic fire protection systems.

In the excavation of the slip, a total amount of 421,700 cu. yds of material were removed. A portion of this material amounting to 30,600 yds. was excavated by a dipper dredge in removing the old brush bulkhead, and was deposited out in deep water. All of the remaining material, consisting almost entirely of black sand, with some silt and a very little clay, was excavated by an electrically operated suction dredge, and was used in making fills on nearby streets and property. The contract price for the excavation was 16c per yard, but enough money was realized on the material sold for fills to bring the average net cost yer yard of excavation down to about 7c per yard.

For the protection of the side slope, a total of 27,157 cu. yds. of rock riprap was used. A very interesting problem was successfully solved in the construction of this slip. It was considered highly desirable to drive the piles before the rock was placed, and the physical character of the sandy soil was such that the slope could not be maintained steeper than about 5 to 1 until the riprap was in place. The procedure adopted for the carrying on of this work proved entirely satisfactory, and the results are all that could be desired.

The sub-structure for the wharf and sheds consists of creosoted fir piles and untreated fir caps, stringers, etc. The piles were given an injection of 12 lbs. of creosote per cu. ft. and were required to show a minimum penetration of 1 in. of black oil. They were driven to a minimum penetration of 20 ft. by a combination of jetting and driving with a 4,200 lb. hammer. Creosoted sway braces were used on each bent. The top of the side slopes are held by 7-in. Wakefield sheet piling driven to a penetration of about 27 ft. and tied back at each bent to an anchor bulkhead by two 1½-in. W. I. rods 40 ft. long.

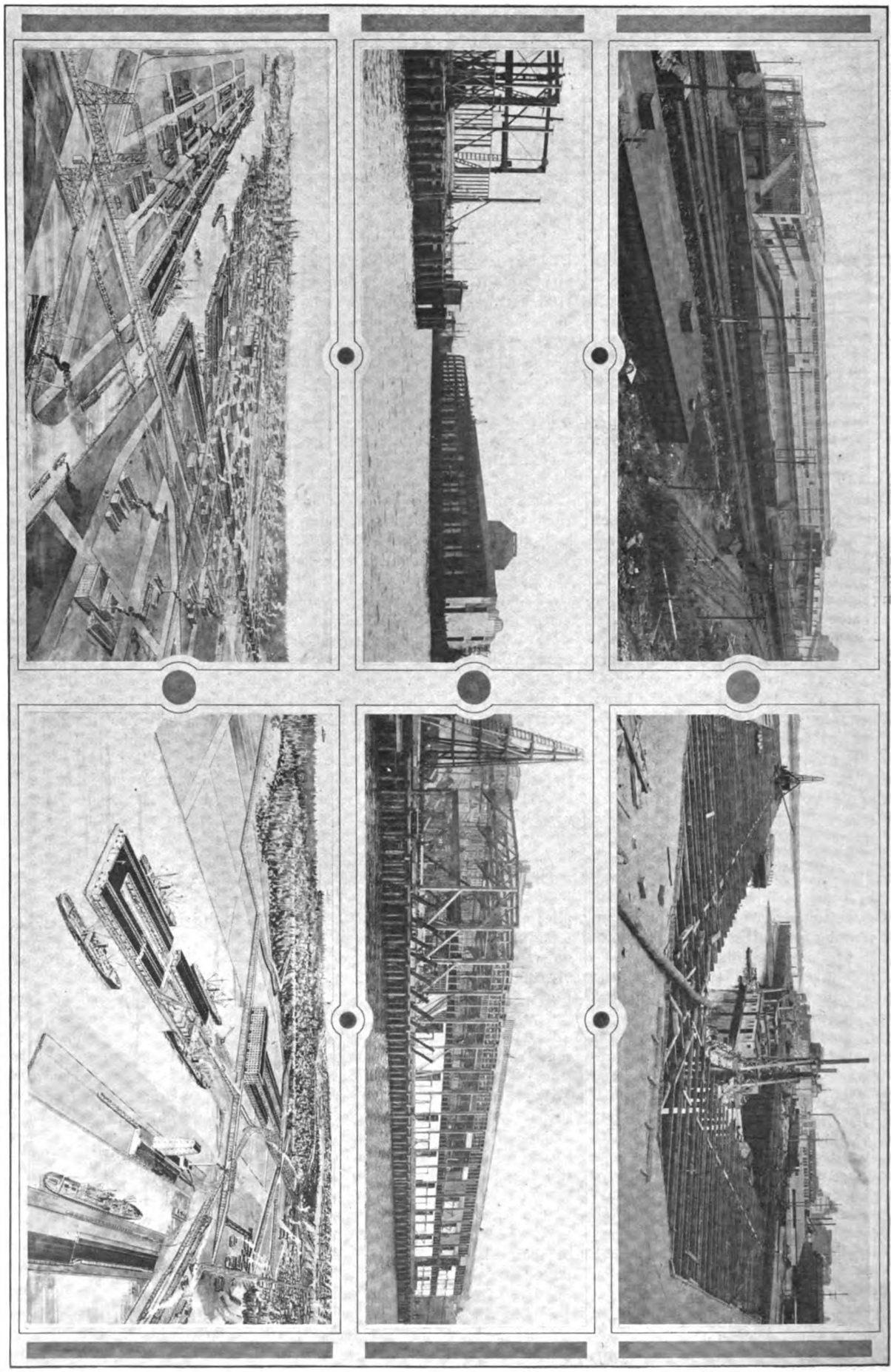
The caps under the building columns are treated with a high-grade wood preservative, as are also all joints of timber to timber. The fender piles are of untreated fir with the bark on, but it is proposed that as these go out or get broken, they will be replaced by creosoted fenders.

Timber and Iron Construction

The sheds are of timber construction covered with corrugated ingot iron. The trusses are 90 ft. in length, giving a clear unobstructed floor area, the bottom chords being placed at the height of 18 ft. above the floor. A series of windows 8 ft. high for the full length of the building above the lower chord on each side, together with a wire glass covered louvre, make these sheds the best lighted structures of their class in Seattle. The driveway down the center line of the building is 30 ft. in width and made up of 4 x 4-in. fir timber laid herring-bone fashion with edge of grain up. Three bays on the slip side are provided with large doors 19 ft. wide and 18 ft. high, all other bays having a 10 ft. x 14 ft. door. The wharf platform between the shed and the fender line is 22½ ft. wide and carries a railway track for the full length of the wharf. This track is of the greatest convenience for the purpose of direct transference between car and ship. Columns, stringers and rail have also been provided on the wharf platform for the installation of a traveling ship's tower. On the opposite side of each shed, there have been constructed two depressed railway tracks, so that the car floors are level with the shed floor. For the full length of these tracks, the building is equipped with lift doors giving a possible opening entirely unobstructed except for the columns themselves. The sheds are covered by a tar and gravel roof built of selected materials. A very complete lighting system is being constructed, arc lamps and Tungsten lights being so installed as to form a very flexible and easily controlled system. All wires are being run in conduit and every precaution is being used to insure the greatest safety of operation. There is being installed the system of plumbing and fire hydrants ordinarily used on piers, and in addition thereto an extensive automatic sprinkler system. Furthermore, each shed is divided into two parts by a fire wall, the driveway opening in which is being equipped with an automatically operating steel shutter door. All this work is being done in order to reduce the fire risk to a minimum, and will result in a very moderate insurance rate.

Shortly before Christmas, 1913, the sailing vessel Dirigo tied up to this pier to discharge cargo of 4,500 tons of blacksmith coal. This event marked the opening of operations at this project.

In May, 1913, work was started on the Central waterfront improvement, which occupies a strip of land about 1,000 ft. in length, reaching from the foot of Battery street on the north nearly to Lenora street on the south. The work done during the year 1913 consists in the complete construction of a two-story merchandise shed, 70 ft. wide and about 950 ft. in length, occupying the south, west and north



CENTRAL WATER FRONT SHED
EAST WATERWAY SHEDS
BIRD'S EYE VIEW SOUTH TERMINAL

EAST WATERWAY SLIP
EAST WATERWAY SHEDS
BIRD'S EYE VIEW NORTH TERMINAL

sides of the area included in the improvement, and the partial construction of a motor boat harbor on the north side thereof.

In a general way, the construction of this wharf is quite similar to the work already described on the East Waterway, and mention will be made of only a few of the more important items that differ therefrom.

Entered in Deep Water

This wharf is constructed entirely in deep water, the depth along the fender line being from 40 ft. to 50 ft. at extreme low tide. Instead of creosoted sway bracing on the bents, this pier is securely held in position by creosoted brace piles driven at an angle of 30 degrees with the vertical plane, and securely tied to the substructure system. During the heaviest wind and seas, there is absolutely no vibration noticeable. The fender piles are creosoted and are securely bolted to the floor system, this portion of the waterfront being too heavily infested with teredo to render advisable the use of plain fenders. In all other respects, the sub-structure design coincides with that on the East Waterway. The second floor of the building is carried on 30-in. steel "I" beams supported by three columns, one of which is in the center of the shed. The roof is carried on full span trusses, giving an unobstructed second floor area. The first floor driveway is made of 4 x 4 timbers laid in the manner already described, while the second floor drive will be asphalted and will connect with paved driveway crossing over the railway track up to the corner of Bell street and Elliott way. The building is covered with asbestos-asphalt roof.

This pier is equipped with three combination elevators and slips, operating from low tide to the second floor of the sheds. These marine elevators are of 10 tons capacity, electrically operated, and are of the very best construction. They are designed to facilitate the work of loading and unloading side port steamers of the Sound type. The doors on the track side of this pier are of the rolling steel shutter type, giving unobstructed opening to the depressed tracks.

On the second floor of the north shed there is a small waiting room that will accommodate the passenger business that it is expected will develop in connection with the motor boat harbor.

The Smiths' Cove pier, now being improved, is 310 ft. x 1,708 ft. in length on the west side and 1,608 on the east side. The central portion of the pier is filled with excavated material, on which will be provided a driveway and four depressed tracks. The structure really forms a double width pier, there being a wharf on each side of the depressed tracks.

On each side of the pier at the outer end, merchandise sheds are being constructed. These sheds will be 96 ft. in width and 600 ft. in length they will be served with depressed tracks in the rear and one track in front of each shed on the wharf apron for direct rail to ship transfer.

On the east side of the pier, a lumber storage yard is provided. There will be a clear space on which to pile lumber, 86 ft. in width and 833 ft. in length. A large gantry crane similar to that which has given such good results at the Hammond Lumber Co.'s plant at Astoria, Ore., is to be installed on this side of the pier. It will be able to cover the entire lumber storage area, so that lumber received either by rail or by barges may be stored on the dock. Much of the lumber so stored will be in reach of ship's tackle, but vessels may also be loaded by gantry crane or by aid of a locomotive crane which it is proposed to have located on the dock.

Open Wharf Platform

On the west side of the pier, there will be an open wharf platform, 86 ft. x 1,055 ft., 600 ft. of which is reserved on which to construct a dry lumber shed, which it is proposed to equip with a telferage lumber handling system. It is proposed to erect this shed when the demand for space for dry lumber is sufficient to warrant it. In the meantime, much lumber can be handled through the merchandise sheds, and the open platform may be used for the storage of ordinary fir lumber. The gantry crane located on the east side of the pier will have a lifting capacity of 7½ tons, and it is designed to not only handle lumber but to facilitate the trans-shipment of structural steel, machinery and similar heavy equipment. In the 100 ft. space just north of the merchandise shed a 100-ton shear leg will be located designed to handle boilers, naval and army ordnances and especially heavy structural material.

The central portion of the pier will be filled as far north as Garfield street, which will provide considerable area for general out-of-door storage.

At the outer end of the pier there will be a berthing space, 310 ft. in length. Large slips for side-port steamers will be provided and if the business warrants, Barlow marine elevators will be installed so that cargoes may be gathered up from Sound steamers for trans-shipment in larger vessels.

In the main, the general plan of the structure will have to be adhered to, but in the details, of course, modifications can be worked out to suit the patrons of the dock.

As the growth of business warrants, the slips on each side of the pier will be further dredged north to Garfield street, which will then provide a serviceable pier a half mile in length or to be exact 2,530 ft., making it as far as known, the longest pier in this country.

Marine Patents

1,092,960. Boat-propeller. Harry Taylor, Hamilton, Ontario, Can., assignor to Horace Wellesley Burrett, Toronto, Can.

1,093,002. Life-preserver. Joseph Magyar, Puritan, Pa.

1,093,065. Starting device for internal combustion engines. Frank Morgan, Melrose, Mass.

1,093,140. Internal combustion engine. Herman Lemp, Lynn, Mass., assignor to General Electric Co., a corporation of New York.

1,093,159. Turbo ship-steadying device. Elihu Thompson, Swampscott, Mass., assignor to General Electric Co., a corporation of New York.

1,093,176. Internal combustion engine. Karl Fruh, Weinheim, Germany, assignor to General Electric Co., a corporation of New York.

1,093,276. Swimming glove. William Laser, St. Louis, Mo.

1,093,357. Folding boat. Edward M. Sanders. Fitchburg, Mass.

1,093,381. Life saving buoy. Albert W. Brown, Elmira, N. Y.

1,093,414. Float. James B. Hill, Chicago, Ill.

1,093,425. Controlling device for waterways. Wilford Lafayette Hurst, Aspen, Colo.

1,093,475. Boat. Orvar G. Rosing, Minneapolis, Minn.

1,093,504. Gun adapted preferably for use in submarine boats. Karl Moller, Dusseldorf, Germany.

1,093,544. Internal combustion engine. Charles De Lukacsevics, West Nutley, N. J.

1,093,586. Internal combustion engine control. Ira H. Krug, Philadelphia, Pa.

The annual report of the Cunard Steamship Co. shows that the profits for the past year amount to $6,383,975. A dividend of 5 per cent was paid on preferred shares and 10 per cent on ordinary shares.

The Way of a Ship

Three Very Interesting Lectures by Sir John Biles at the Royal Institution of Great Britain

SIR JOHN BILES has recently delivered three very interesting lectures at the Royal institution of Great Britain on general principles relating to ocean-going ships of both merchant and naval types. While no new statement has been made in connection with these, they form a very instructive summary of all that the naval architect has to bear in mind when designing a ship which is intended to go to sea in all weathers and to perform set duties.

The first lecture was entitled "Smooth Water Sailing." Elementary questions of weight and buoyancy were examined, and the result of considering a ship at rest in still water was shown to be that the weight of the water displaced by the ship is equal to the weight of the ship, and the centers of gravity of the ship and the displaced water must lie in the same vertical line. When inclined to reasonably large angles from her position of rest, her form should possess sufficient stability to restore her to the upright position. She must also be made of material suitable to resist the forces due to the inequality of weight and buoyancy at different sections of the ship, which tend to separate the parts of the structure from each other.

The vessel was then assumed to be set in motion in still water, and the fundamental considerations of resistance and propulsion were explained. Sir John indicated that the solution of obtaining a required speed from a given ship was to determine the resistance of the ship at that speed, and to supply her with a source of power which could deliver the force equal to this resistance at the required speed. The determination of resistance is effected by separating it into frictional and wave-making resistance. The first can be calculated for any ship from known data. The second can only be accurately determined by model experiments. An experimental tank is costly to build and maintain. Fortunately, there is now available to all a tank of this kind at the National Physical Laboratory, and its usefulness is increasing daily. As an example of this a case was quoted in which 25 per cent reduction was made in the resistance, and also practically another 25 per cent in the added efficiency of the propellers. It will be seen, therefore, that with this tank to fall back upon no one need make great mistakes in predicting the horse-power necessary to propel almost anything, or to make designs of unusual forms. Similarly the best propeller for a design can be obtained from tank experiments.

In touching upon the speed of ships, Sir John Biles outlined a brief history of sailing and steam ships. The first steamer to cross the Atlantic was the Savanah, in 1819; she was 145 ft. over all, 26 ft. beam, and was designed to steam at 6 knots. She actually crossed under sail. From this time to 1869 the speeds increased to about 12 to 13 1/2 knots. In 1869 they rose to 14 1/2 and 15 knots; in 1893, to 22 knots; and at the present day the Lusitania and Mauretania reach practically 26 knots. Last year the Exmouth II was completed for the Metropolitan Asylums Board, a sailing ship of about the same size as the Savanah, and built with the object of training boys for sea. Sir John's remarks on this subject are worthy of note. "It is a pity," he observed, "that in a country which depends so much upon seafaring for its existence there are not many more such vessels. There is a good deal spent upon education in this country, while so little of it goes to the training of boys for the sea. There is much more real sport in taking part in the sailing of a vessel like Exmouth II than in all of the football or cricket games that ever were played."

Ocean Travel

The second lecture dealt with the subject of "Ocean Travel." This was once described as "something worse than going to prison, with the additional chance of being drowned." This chance is not now so great as being run over in the streets of London. Sir John then proceeded to point out the large increase in speed and size of ship in recent years, due to the change from wood to steel and the use of high-pressure steam, surface condensers, and turbines.

The effect of waves upon the stresses to which ships are subjected at sea was traced, from the increase in the size of waves from a ripple to very large waves. The stresses are a maximum when the length of the wave is equal to that of the ship. In ocean-going steamers, on account of their lading, the stresses are greater when on the crest of such a wave than when in the hollow. The effect of bodily heaving of the ship into, or out of, the wave is to reduce the stresses on the crest and increase those in the hollow. The effect of pitching is to increase the stresses at the ends of the ship. The sizes of waves at sea depend upon the stretch of water along which the wind can blow. In the North Atlantic 600 ft. seems to be a very long wave, and the height occasionally reaches 43 ft. It is very doubtful if a ship as large as the Imperator would ever meet waves of her length in the Atlantic, so that the stresses calculated upon the usual assumption of a wave the length of the ship and height equal to one-twentieth the length would be much greater than the actual state of affairs. That the theory underlying these stress calculations is sound was proved by the experiments carried out some years ago on the torpedo-boat destroyer Wolf at Portsmouth. She was very severely tested, and the results obtained proved conclusively that the theory was sound.

Dealing with the subject of rolling of ships amongst waves, Sir John said that "It seems a paradox that if a ship had no stability she would not roll." The greatest rolling takes place when there is synchronism between the ship and the waves. In this case only the ship's resistance to rolling can prevent disaster due to capsizing.

The third lecture, on "The War Navy," dealt with the development of types of warships. The variation in interest in the navy indicated by the record of the number of men borne on the books and the total money spent. In 1816 there were 35,000 men; in 1836, 30,000; in 1856, 60,600; in 1876, 60,000; in 1886, 61,400; in 1896, 93,700; in 1906, 129,000; and today, 150,000. In 1816 and in 1886 the cost was 13 millions; now it is four times as much. About 25 years ago the eight chief naval powers spent 39 millions; last year they spent 167 millions, or more than four and a quarter times as much. The Victory, built in 1765, was little different from the Duke of Wellington, laid down in 1850. In 1865 the momentous change from wood to iron had begun. The old wooden ships ceased to represent our naval power in the seventies of last century, but the men who designed ships' engines and guns

in 1876 are the same class as those who do it to-day. In the twenty years succeeding the anniversary of the building of the victory, the whole of the change from ships of her day to ships of our day was made. Minor changes have been made since, but they are as nothing compared with those of that twenty years. The period from 1885 to 1905 can be passed over with little consideration. In the latter year the Dreadnought was launched, and so momentous was that event that we now think and speak in Dreadnoughts, positive, comparative and superlative. The active brain of Lord Fisher, with his readiness to take advantage of all the other active brains with which he came in contact, focussed the development of thought in the direction of increased destructive power. Since 1905, Dreadnoughts have largely monopolised public attention. But to-day the submarine is the most interesting. It is a weapon of attack to which up to the present there is no reply. It steals silently up to its prey, delivers its attack, and disappears. It is invisible, and may be called one of the unseen powers; but it is eminently a weapon which can be most successful in peace time. What it will do in war time, when the restraint of its opponents is withdrawn, can only be guessed. Now those in the submarine know that they will not be run down if discovered. In war this terror will be added and will produce its moral effect. There are 8 submarines of 204 tons and 600 h. p.; 47 of 316 tons and 600 h. p.; 8 of 620 tons and 1,200 h. p.; and 18 of a larger class. The lightness of destroyers' construction was deemed by some to betoken short life, but there are some which are twenty years old still in our navy doing good work. The destroyer, light cruiser, and all the types were fully described and illustrated by the lecturer. Only two decisive fleet actions have taken place in fifty years. In the first a chance shot decided the victory, though no ship was sunk or put out of action. In the second, the whole of one fleet was either captured or destroyed. Truly, modern conditions produce the same final results as those of old.

Navy Yard Design

Its General Organization, Considering Location, Capacity and Maintenance

IN THE absence of Capt. L. S. Van Duzer from the December meeting of the Society of Naval Architects and Marine Engineers, his paper entitled "General Organization of Navy Yard Design, Location, Capacity and Maintenance with Plan and Description of a Large, Efficient Yard Properly Located," was read by Secretary Cox and abstracted as follows:

This paper has been prepared to show that we must have at least one large navy yard where the entire fleet can be effectively repaired and supplied in time of war. That fact being admitted, the question is considered from three principal points of view, viz.: (1) Suitability of location, (2) capacity of yard, and (3) cost of construction, maintenance and operation.

After considering the various requirements, it is pointed out that the position of New York is superior to all other ports on the east coast. It is, however, maintained that a better location may be obtained for the creation of a new navy yard at Communipaw, N. J., than is afforded by the present location in Brooklyn. The new yard would be a mile or two further away from an attack by sea and also close to all the great trunk lines of the country. It would still possess the advantages of the labor supply afforded the Brooklyn yard.

The great opportunity of designing a new, modern and up-to-date establishment for the construction and repair of ships is shown, and a tentative plan is presented. It is declared that the great expense of the new navy yard would be for the most part covered by the price obtained from the sale of the old navy yard.

E. A. Stevens Jr.:—I think the suggestion of Capt. Van Duzer is an excellent one, in regard to location, but it seems to me the sticking point would be to get congress to appropriate sufficient funds to build the yard in the proposed position. Consequently, on account of the everlasting politics, I am afraid it would be a hard fight—the Brooklyn representatives would put up a hard fight to keep the navy yard in Brooklyn. Such a proposition, however, in my opinion, should not enter into the position of the navy yard, whether it is a question of the location of the yard, or the building of the ships, or anything else, it should be done to the best interests of the country and not for the benefit of any particular location. Provided that the location can be dredged, there is absolutely no doubt but what the proposition is a much more attractive one than the present Brooklyn navy yard. The approach is very much easier and as Capt. Van Duzer says in the paper, it is further from attack at sea, and not only that, but it is nearer—I have not measured the distance, exactly, but I should say it was at least two miles nearer to Sandy Hook than the present location, and when it comes to a question of speed, it would be infinitely more so on account of the slow speed with which the battleships are required to navigate the East river. The layout Capt. Van Duzer has put before us evidently shows a good deal of thought and seems to be excellently worked out. The location is infinitely better for the transportation of materials, as at very small expense a railroad could be run in there connecting up with two of the main lines, to run to the western part of the country, to Pittsburgh and the steel industries. Everything which is destined for the Brooklyn navy yard has to be taken out of the cars and put on lighters, and transported over there. In time of war, when everything is in a rush, it might be you could get one or two battleships out on line, immediately, with the new location, and in that way this quick action might make the difference between a victory or defeat.

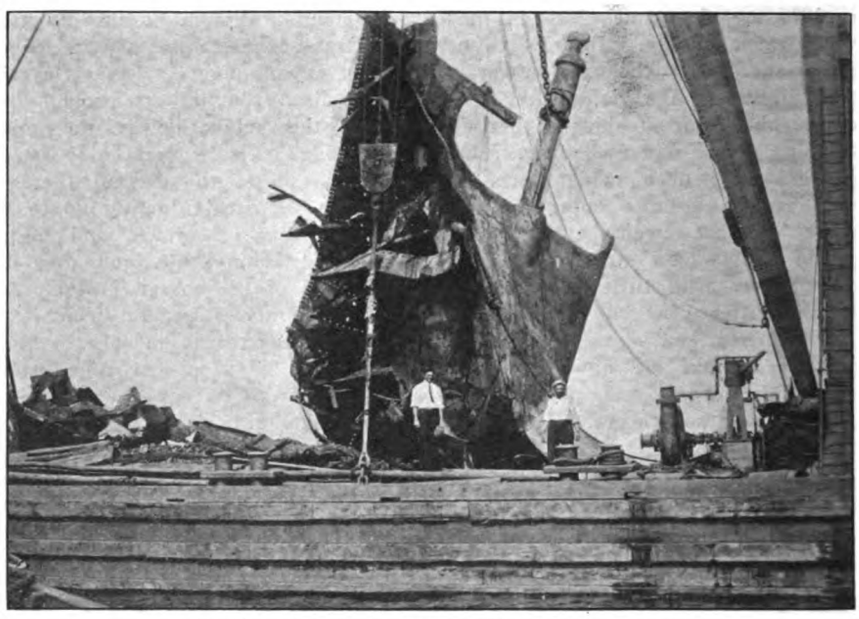
Francis T. Bowles:—I will mention the fact that I was stationed at the Brooklyn navy yard for a number of years, and incidentally became well acquainted with local politics. It has always seemed to me with regard to the Brooklyn navy yard, and all navy yards, that naval officers, as a rule, confuse the function of a navy yard, and attempt to combine what I call a naval rendezvous with an industrial plant. When you see at the Brooklyn navy yard a party of sailors playing football, and another party of sailors sitting around on the benches watching the game, it is more or less difficult to keep any workmen busy.

Now, that is a mere illustration of the continual conflict between the interests of a naval rendezvous, that is where men are assembled for distribution, and recruited and trained to some extent in the performance of their duties, and where stores are kept for renewing supplies on vessels, and a place where industrial work is performed. If there were no other handicap in the way of the navy producing battleships and other vessels at a cost equivalent to what can be obtained under contract, the cause that I have mentioned would alone prevent it.

The navy has a very large investment in the Brooklyn navy yard, in the way of drydocks and costly buildings, some of which are very well adapted for the manufacturing purposes for which they are occupied. I venture to say that if all the features of the naval rendezvous were removed from the Brooklyn navy yard, that the efficiency of the yard for repairs and construction would be enormously increased, and for industrial purposes.

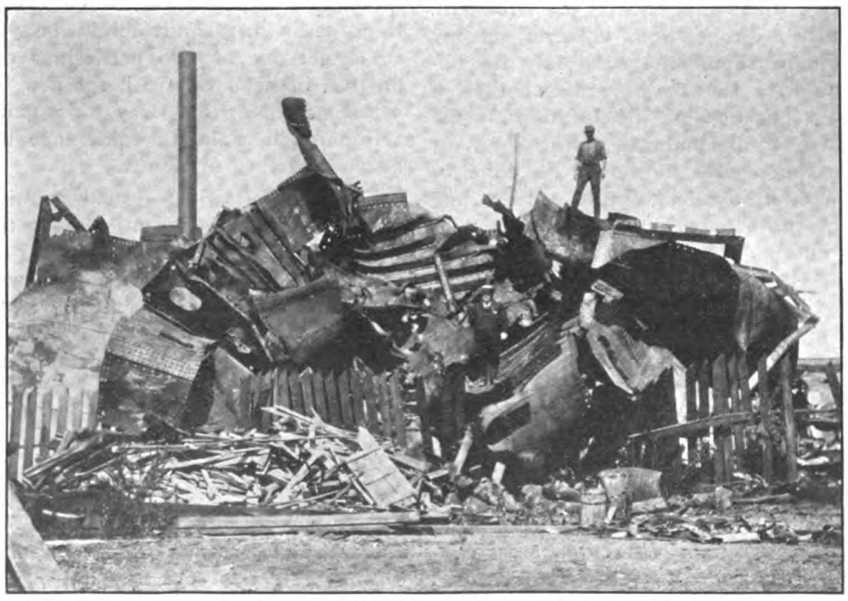
Cutting Up a Wreck

The tangled wreckage of the 1,800-ton steel freight steamer Alum Chine, which was destroyed by a dynamite explosion in the lower harbor of Baltimore, has recently been reduced to steel mill scrap with the aid of the oxy-acetylene cutting torch. This steamer was destroyed by an explosion of 300 tons of dynamite in its hold while loading a cargo for Panama on March 7, 1913. The violence of the explosion was so great that the entire forward part of the ship was blown away, the deck and upper works being reduced to bits and scattered over the harbor and adjacent shores for a radius of several miles, while the major part of the hull was thrown to the bottom in 33 ft. of water. Pieces of steel 3 to 5 ft. long were found from 2 to 3 miles from the wreck.



LIFTING HEAVY STERN SECTION FROM SCOW

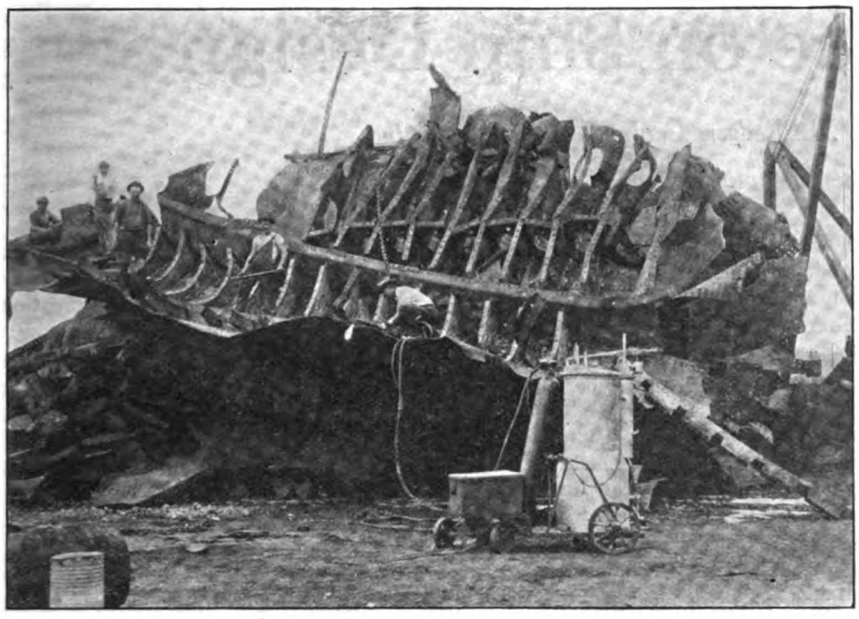
A survey of the site showed that the after part of the hulk, containing several hundred tons of steel, lay just outside the channel, covered by about 13 ft. clear depth of water. The entire upper works, boilers and engines were gone, and the steel beams and plates were badly bent and twisted. It was necessary to remove the wreck in order to protect navigation and a contract for this was let during the summer to the Merritt-Chapman Derrick & Wrecking Co., of New York. An 80-ton steel floating derrick was detailed to the work. Divers were sent down to lay strings of dynamite which were exploded under the water so as to cut the hulk into pieces of a size that could be handled by the derrick. The sections were then lifted onto a scow and towed to the dock and yard of the Southern Iron & Metal Co., of Baltimore, which company purchased the steel from the wrecking contractors for disposal as steel furnace scrap. At the dock, the floating derrick laid down the 25 to 40-ton pieces of the hull in a huge pile, as shown in the accompanying views.



PILE OF WRECKAGE BEFORE DISMANTLING

Each large piece was a shapeless mass, with the plates, beams and members bent and crumpled. Rivets could not be removed to good advantage since in many cases the flanges of angles or pieces of plate were bent over flat against them, preventing access to their heads. Most of the skin plate of the ship was 5/8-in. steel, running to greater thicknesses in some portions along the bottom. The ribs and longitudinal frames were deep, built-up sections of plates and angles. The condition of the steel was such that the expense of ordinary hand cutting would have been prohibitive and the wreckage would have been a total loss had the oxy-acetylene process not been available.

A Milburn oxy-acetylene plant mounted on a truck for portability was supplied by the Alexander Milburn Co., of Baltimore. One torch operator was employed, long lines of gas hose being provided to allow him sufficient freedom of movement about the wreckage to attack it from points of greatest convenience. As fast as the pieces of steel of suitable size for



TORCH OPERATOR STARTING TO CUT BOTTOM PLATES

handling were cut out by the torch, they were loaded on wagons and then to freight cars for transportation to the mills.

It was impossible to establish a definite routine of dismantling the wreckage, both on account of the condition of the steel-work and on account of inaccessibility. The work was simply started from the top or one side of the pile and carried on as far as convenient from that point, then resumed from some other point.

Owing to the irregularity of the work, very little data was obtainable as to the rate of progress and other details. This was also complicated by the fact that the work was also carried on only periodically, the operator being otherwise employed during a considerable part of his time.

Campaign for Sanitation

The Lake Carriers' Association, through its welfare committee, has decided to launch a vigorous campaign for sanitation for the conservation of the health of the men aboard ship. The initial steps are being directed toward the source of food supply and an inspection will be made of the manner in which the various supply houses keep and deliver their products. The general plan of campaign was submitted some time ago to Dr. Darlington, the sanitary expert, who was so greatly interested that he made a special visit to Cleveland and conferred with the members of the welfare committee, visiting at the same time a number of supply houses and milk people, with Archie Thompson, a member of the welfare committee.

A circular has been drafted which will be mailed to all of the supply houses doing business with the Lake Carriers' vessels defining what is desired of them in the way of cleanliness. The instructions to the dealers have largely to do with the care of meats which must in all cases be wrapped up for delivery. Nothing, in fact, is to be left uncovered, as it has been generally proved that the house fly is one of the most common sources of infection. All baskets in which food supplies are delivered to boats must be lined with fresh paper for each delivery.

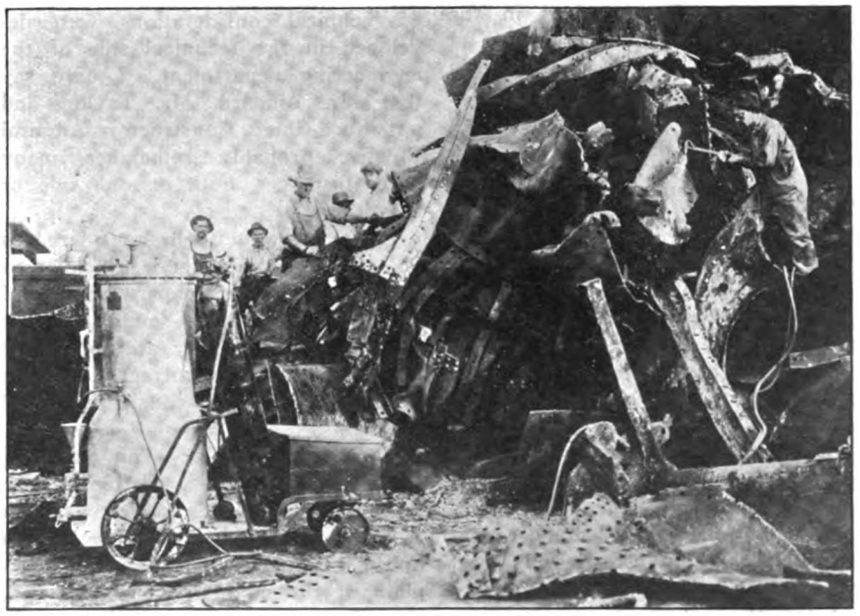
As manufactured ice is absolutely pure, being made from distilled water, while natural ice may have been cut from a doubtful area, dealers will be required to supply the manufactured product wherever possible. It is, of course, not possible to do this in all ports.

Lighthouse Tender Fern

The following bids have been received by the commissioner of light houses, Washington, D. C., for the construction, equipment and delivery of the single-screw, wood, steam-propelled lighthouse tender Fern. McAteer Ship Building Co., Seattle, Wash., $108,600; alternate bid, for substituting Douglas fir in lieu of oak, etc., $99,800. Rice Bros. Co., East Boothbay, Me., $106,000; navy yard, Puget Sound, Wash., $75,000; alternate bid, $71,865. American Car & Foundry Co., Wilmington, Del., $83,420; add for B. & W. boiler, $3,500; deduct for Roberts boiler, $450 and $600; add for forced draft, $1,500. Hall Bros. Marine Railway & Ship Building Co., Winslow, Wash., $62,000, delivery 165 days; alternate bid, for substituting Douglas fir or Puget Sound fir, $59,000, 125 days. Greenport Basin & Construction Co., Greenport, N. Y., $96,467. Racine-Truscott Shell Lake Boat Co., Muskegon, Mich., $80,300. Spedden Ship Building Co., Baltimore, Md., $104,497.

The Chicago Shipping Co. has opened offices at Nos. 545 and 546 Webster building, Chicago, with W. D. Leary in charge. Correspondents of the shipping company are the Duluth Shipping Co., of Duluth, and the Standard Shipping Co., of Winnipeg. R. A. Williams is the Cleveland agent for the three companies.

The steamer Charles A. Weston went ashore above Port Sanilac, Lake Huron, in a fog, on April 25, and it was necessary to lighter 100,000 bu. of grain to release her.



CUTTING BENT AND TWISTED PLATES WITH OXY-ACETYLENE FLAMES

Influence on Ship Design

Capt. W. L. Rodgers Contributes a Paper on the Influence of National Policy on Ship's Design

CAPT. W. L. RODGERS contributed a paper to the December meeting of the Society of Naval Architects and Marine Engineers on "The Influence of National Policy on Ship's Design," which was read by Capt. Robinson and abstracted as follows:

1. This influence has been marked at all periods of history.

2. Historical examples: Actium, 31 B. C.; Spanish Armada, 1571 A. D.; American Civil War, show that policy rules types of ships.

3. Lack of control of ship design by national policy in United States during period from civil war to Spanish war led to unsuitable types.

4. Present arrangements in navy department to insure that general military characteristics of ships shall be such as best to support national policies.

5. Example taken from history of German ship-building shows that foreign powers build their navies with definite foreign policies in view.

6. Conclusion that naval architects must keep in close touch with the exponents of national policy.

At the conclusion of the reading, Capt. Robinson said:

"I happened to be for eight years at one end of the line that has to do with building ships at Washington, and while my view is, perhaps, somewhat warped, I was not blinded. Capt. Rodgers refers to the fact that our lack of ability resulted in the production of unsuitable types of ships. I think there is something in what he says, but I do not think it is any more true of our service than any other service during the period of which he spoke. Somebody referred to the French navy as a collection of naval samples, so I suppose the same criticism as made here must have been applicable to that service.

"Capt. Rodgers refers to Germany as apparently an example which should have been followed. I have never been of the opinion that we knew it all, or that we could not learn anything from Germany, but my experience with the navy department and the war college, where Capt. Rodgers was president, led me to believe that Germany was largely held up as an example because it was probably the nation about which we knew the least. The results are very good, but just why they do it, we do not know. They are very reticient about their reasons, and therefore they are supposed to have very excellent reasons.

"The General Board is referred to as having a further duty, to ious types of ships which it recomcharacteristics desirable in the varstudy and report on the military mends, following which is a definition of military characteristics. I think I am correct in saying that at least three times while I was in the service I wrote and asked what a military characteristic was, but never had any definition before, but have it here. I remember several instances when the military characteristics were prescribed in the design of ships, while I was in the navy department, one of which stated that the vessel should be fitted with a No. 8 jeweler's lathe, which did not seem to me to be a very broad feature.

"It is quite the custom for the General Board to dictate the type of armor design and the shape of the back of the armor plate, and the shape of the bow of the ship, particularly under water, etc.,—it was very seldom made the way they dictated, but these features were almost always included in the military characteristics. Such features as the vertical echelon arrangement of turrets, and other things which are really based on technical considerations, were developed in the technical side of the engineering department. I dare say that Mr. Linnard, Mr. Taylor, and possibly, Chief Constructor Admiral Bowles, probably remember many other instances, both on one side or the other.

"I do not want to be considered as objecting to the general principles as formulated in the paper, because I think they are very sound, but the manner in which they are sometimes carried out is not correct according to what might be considered good practice."

Francis T .Bowles:—This paper, I think, ought to be a gratification to the members of this society. I can recall times when officers in the line of the navy have been heard to complain of the methods of design, etc., that they were not what they ought to be, and criticize the views of naval architects and marine engineers. This paper informs us, to our gratification, that the navy department has now a method of producing the designs of vessels, which is suitable, and that the vessels produced are creditable, and I am very much pleased to hear it. No doubt the members of the society are gratified.

Coal Handling Mashinery in Canal Zone

The Hunt Construction Co. of New York has been awarded contract by the Isthmian Canal Commission for the installation of coal handling machinery at Cristobal and Balboa, canal zone. Four unloading towers will be installed on the Cristobal docks on the Atlantic side and two on the Balboa docks on the Pacific side. The total cost of the installation will be $1,833,127. The towers will travel on rails and will deliver the coal from the vessels and deposit it in the hopper built in the tower, where it may be delivered through chutes to cars or into stores. The installation will also include stocking and reclaiming bridges.

The Panama canal is practically completed and the ships enrolled in oversea trade in the Pacific ocean flying the American flag are the following: Manchuria, Korea, Siberia, China and Mongolia, of the Pacific Mail Steamship Co.'s fleet, and the Minnesota, of the Great Northern Steamship Co. Some marine.

The Business Men's Association of Auburn, N. Y., believes that there is a good opportunity to build up a passenger and freight business on Cayuga Lake, a body of water 40 miles long and from 2 to 4 miles wide, with the city of Ithaca at its head. There is no regular public traffic on the lake at present.

The Portland Shipbuilding Co., South Portland, Me., is building a steamer 110 ft. long, 24 ft. beam and 10 ft. deep for the Cape Breton Electric Co., Sydney, C. B. The machinery will be furnished by the Burrell-Johnson Iron Works, Yarmouth, N. S.

The J. W. Frazier Co., engineers, have moved from Rockefeller building to Illuminating building, Cleveland.

McMyler Dumper at Greenwich

The Pennsylvania Railroad's New Installation at Greenwich Point, Philadelphia, is making an Excellent Record—It Marks the Adoption of the Lake Method of Loading Coal at Coast Terminals

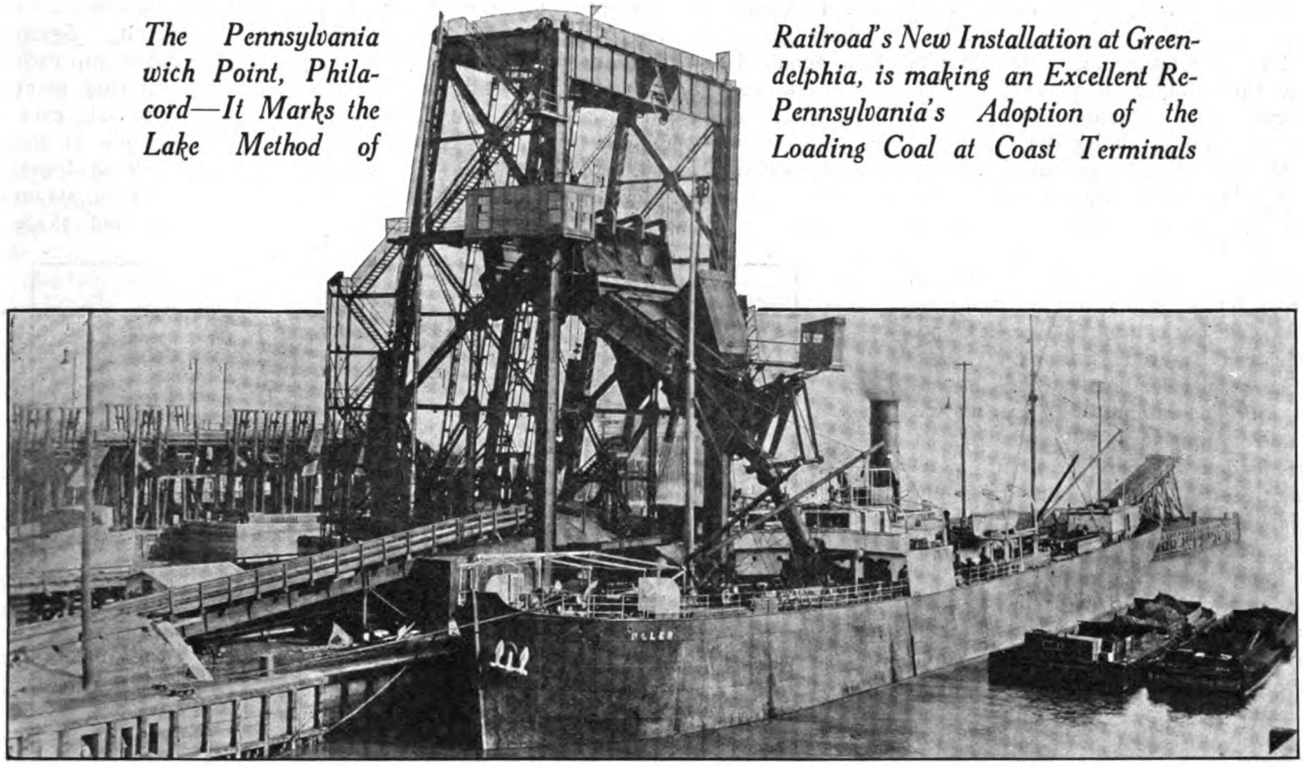


FIG. 1—COAL DUMPER AT GREENWICH POINT, SHOWING CAR PARTIALLY OVERTURNED

First Cargo Dumped at Greenwich, Sept. 29, 1913

AT Greenwich piers, Philadelphia, the Pennsylvania railroad has put into commission a new coal dumper of the type which of late years has been adopted quite generally by trunk line railroads for facilitating the transshipment of coal at their Atlantic coast terminals. The construction of this plant was authorized by the railroad on Jan. 10, 1912, and contracts thereupon were let to the Engineering Construction Co. and the McMyler Interstate Co., both of Cleveland. These concerns began their work on April 1, 1912, and on Oct. 1, 1913, the completed plant was put in operation. Since then it has been in constant service, on a 20-hour schedule, the men working in two shifts of 10 hours each. The machine is capable of elevating a car of coal, discharging its contents and again lowering it to its original position in the short period of 1½ minutes; as a rule, however, its steady working performance in ordinary weather is to dump 25,000 tons of coal in 20 hours, or at the rate of 1,250 tons per hour. In extremely cold weather, when the cars must be thawed out before dumping, this reduces to 15,000 tons, or 750 tons an hour.

Greenwich yard for many years has been the point at which the Pennsylvania railroad has loaded into ocean-going vessels the coal consigned from the mines along its lines to foreign or coastwise ports. Until the new coal dumper was installed ships were loaded entirely from piers of the usual wooden trestle variety. Into bins in these piers the coal is dumped from hopper cars, thence being discharged, by gravity, through wooden chutes which direct the streams of coal through the hatches of the vessels. While this, under modern conditions, is not the most economical and efficient method of transferring coal from the cars to the vessel the additional objection frequently is urged that by reason of the sheer drop from the end of the chute to the bottom of the hold, a considerable amount of breakage necessarily occurs which brings about an appreciable degree of deterioration in the quality and, consequently, the value of the coal. The new mechanical dumper is especially designed to eliminate the possibility of such breakage, being provided with a chute of telescopic construction. By means of cables which control its three members the length of this chute may be adjusted to conform to the depth of any vessel, and, as a result, the coal passes to the bottom of the hold in a compact mass. As the hold becomes filled, the length of the chute is shortened and thus the coal, during the entire loading operation, flows, rather than drops, into the hold. The wooden piers which formerly constituted the entire loading facilities now are employed only when business is so brisk that the machine is unable to do all of the work. The piers are four in number; they have an aggregate capacity for loading 18,000 gross tons in 10 hours, while, by adding a night shift, the capacity can be stretched out to 25,000 tons.

The essential operating features of the new mechanical dumper are the tipple, which elevates and overturns the car; the pan, which receives the coal from the overturned car, and the chute, through which the coal flows from the pan into the hold of the vessel. The tipple and pan may be raised or lowered to correspond to the height of the particular vessel, while the chute, in addition to the longitudinal motion described above, has a universal transversal motion which makes it possible to distribute uniformly to all parts of the hold. The movements of the tipple, pan and chute are controlled from cabs in the tower, being effected by means of cables which are actuated by engines. The latter are located in the engine room in the tower base. The cables

which are used in operating the various parts of the dumper aggregate a total length of more than two miles, and range from ¼ to 1⅛ in. in diameter.

The accompanying photographs show the dumper in the act of discharging the contents of a 50-ton steel car. Fig. 1 shows the car in the act of being overturned; in Fig. 2 the car has been overturned and the contents are being discharged, while in Fig. 3 the car has been turned through the full angle of 135 degrees, is completely empty and is ready to be turned back into the vertical position and lowered.

The tracks leading to the dumper are four in number and are known, in railroad parlance, as "hump" tracks. The loaded cars are brought by locomotives to the top of the hump, which is about 700 or 800 feet distant from the dumping machine. From the hump they are dropped by gravity, one at a time, down a 5 per cent grade which terminates in a dip in the track about 100 ft. from the dumper. Here they are picked up by a cable-operated "barney" hoist, which comes

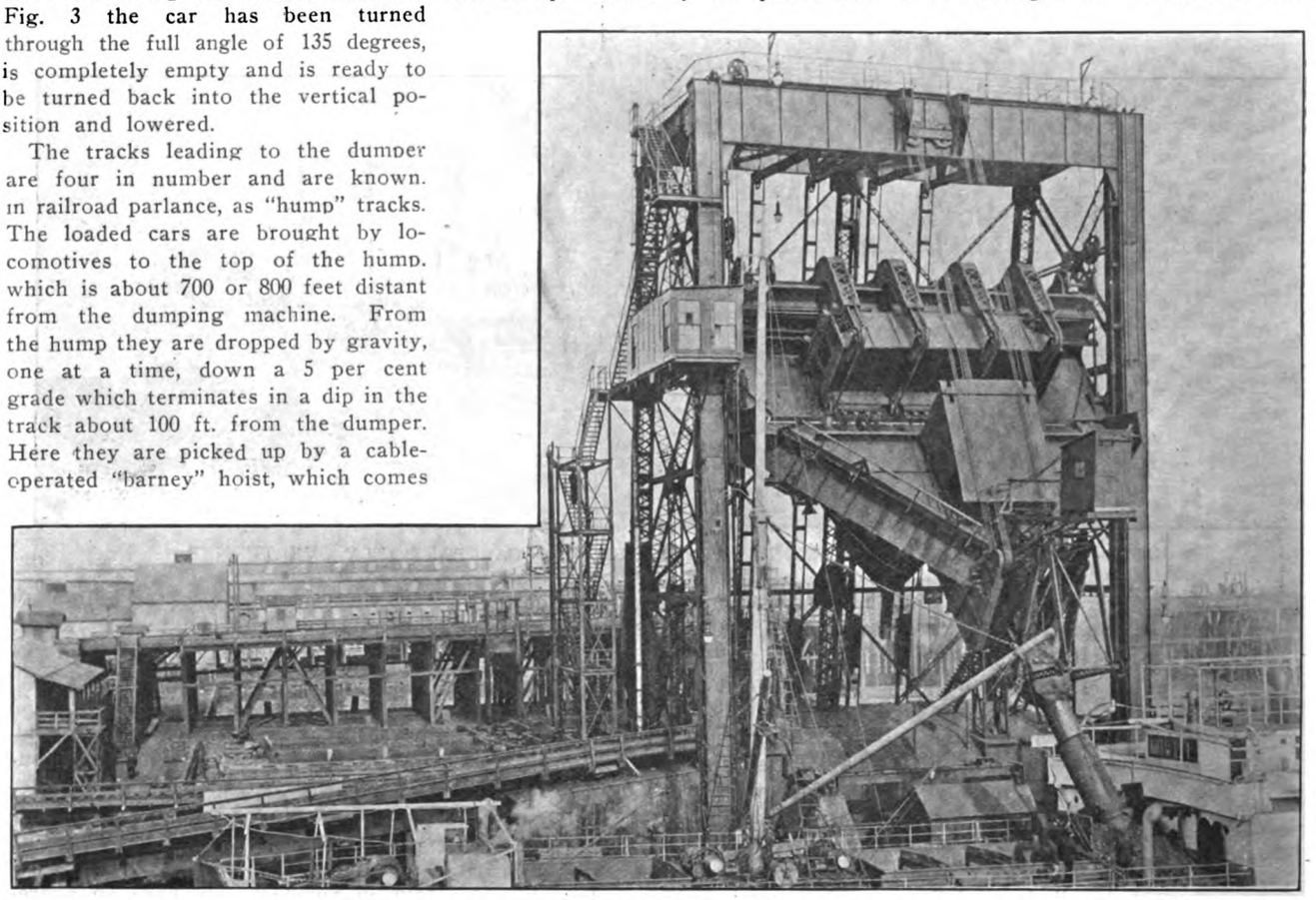


FIG. 2—COAL DUMPER AT GREENWICH POINT DISCHARGING CONTENTS OF CAR INTO PAN

up out of a pit between the tracks, and which runs on narrow-gage tracks, located between the wide-gage tracks. The barney hoist, by means of a steel ram, engages the coupler of the loaded car and pushes it up a 10 per cent incline to the machine. Here the car is spotted on the platform of the tipple, four steel clamping arms engaging its sides and top, in order that it may be held securely in position. The tipple then is elevated and rotated through an angle of 135 degrees, after which the car having been emptied of its contents, is lowered to its original position.

The next loaded car, being pushed up the incline by the barney hoist strikes the empty, causing it to roll down an incline to the outer end of the pier. Here the track terminates in a "kick-back" or sharp ascent which reverses the movement of the car. In returning the car passes through a spring-switch in the track, thus being diverted to another inclined track which guides the empty to the "empty" yard. Owing to the momentum acquired by the cars from the kick-back and the incline, they roll into place in the yard, the trains of empties thus assembling themselves automatically. Indeed, from the time the cars are deposited at the top of the hump, until they are pulled out of the yard as empties their movement, with the exception of the short haul by the barney hoist, is effected entirely by gravity. Each car, in order that the couplers may be set properly and the brakes be controlled, is accompanied by a brakeman. As the empty and loaded yards parallel each other, not much time is lost by the brakeman in climbing aboard another loaded car after having dismounted from an empty.

The capacity of the loaded yard, from which the car dumper is fed by gravity, is 55 cars in the aggregate. The capacity of the empty yard is 65 cars. Adjacent to the coal dumping plant is the Greenwich yard, with a storage capacity of about 1,500 loaded cars and from this source the coal dumper is supplied.

The cars, in cold weather, are subjected to treatment in a thawing plant which is located at the top of the hump. This is a 40 x 300-ft., reinforced concrete building which spans three of the loaded tracks, the fourth track passing alongside it. Seven cars can be accommodated on each track, thus giving the thawing plant an aggregate capacity of 21 cars. When in operation, the ends of the building are sealed by insulated doors. The heating plant consists of steam coils arranged in series, and three engine-driven fans, located in the top of the building in what is partitioned off as a sort of second story. In the horizontal partition holes are spaced off at regular intervals, and by means of these, air is exhausted from the lower portion of the building, being induced through the steam coils. The heated air then passes through galvanized pipe of large diameter which lead to six rows of galvanized wall pipe that extend the length of the building, the pipe being spaced about 3 ft. apart. From these, the heated air is discharged, coming in contact with the bottoms and sides of the cars. After having been projected against the cars, the air ascends and again is exhausted through the holes and passed through the steam coils. Thus is maintained a constant circulation of the atmosphere within the building, no heat being wasted.

The temperature in the thawing plant is maintained at about 200 degrees, Fahr. In extreme cold weather, about one hour is required for thawing out a 50-ton, steel car loaded with bituminous coal; for thawing out a similar carload of anthracite coal, about 1½ hours are required. In case of wooden cars, the time required for thawing out is about twice as great. For this reason, wooden cars greatly reduce the capacity of the loading plant in cold weather.

For supplying steam to the thawing plant and engine room, there is a concrete boiler house, which, in addition to four horizontal boilers, having total capacity of 1,800 H. P., is equipped with an underwriters' pump, boiler feed pumps, etc. The plant also is provided with a fully equipped machine shop in order to facilitate the making of repairs to the car dumper and other parts of the plant when necessary. This is housed in a separate concrete building adjacent to the boiler house.

The dumper is located on a concrete-faced pier, 700 ft. long, and the slip alongside has been dredged to a depth of 30 ft. at low tide, which is ample to accommodate any vessel that can come up the Delaware. The steel frame of the dumper rests upon a foundation built up of approximately 25,000 cu. yds. of concrete and reinforced with 50 tons of old steel rails; this foundation, in turn, is shored up on 750 piles, thus providing a very substantial structure.

For spotting the hatches with reference to the chute, ships are moved by means of an electrically-operated cable which commands the entire face of the pier. In moving ships, it frequently is necessary to elevate the outer end of the pan in order to provide sufficient clearance for the masts. This motion is effected by means of cables, and the pan may be brought into a nearly vertical position, thus taking it entirely out of the danger zone.

At this pier vessels are loaded with cargoes ranging all the way from 50 to 10,000 gross tons. The coal goes principally to New England points. Outside of this, the bulk goes to the West Indies. A large per centage of the shipments also are made to Italy, France and South America.

While the coal dumper is owned and controlled by the Pennsylvania railroad, it is in charge of the Eastern Coal Dock Co., which maintains a force of about 125 men for operating the machiniery and doing the stevedore work.

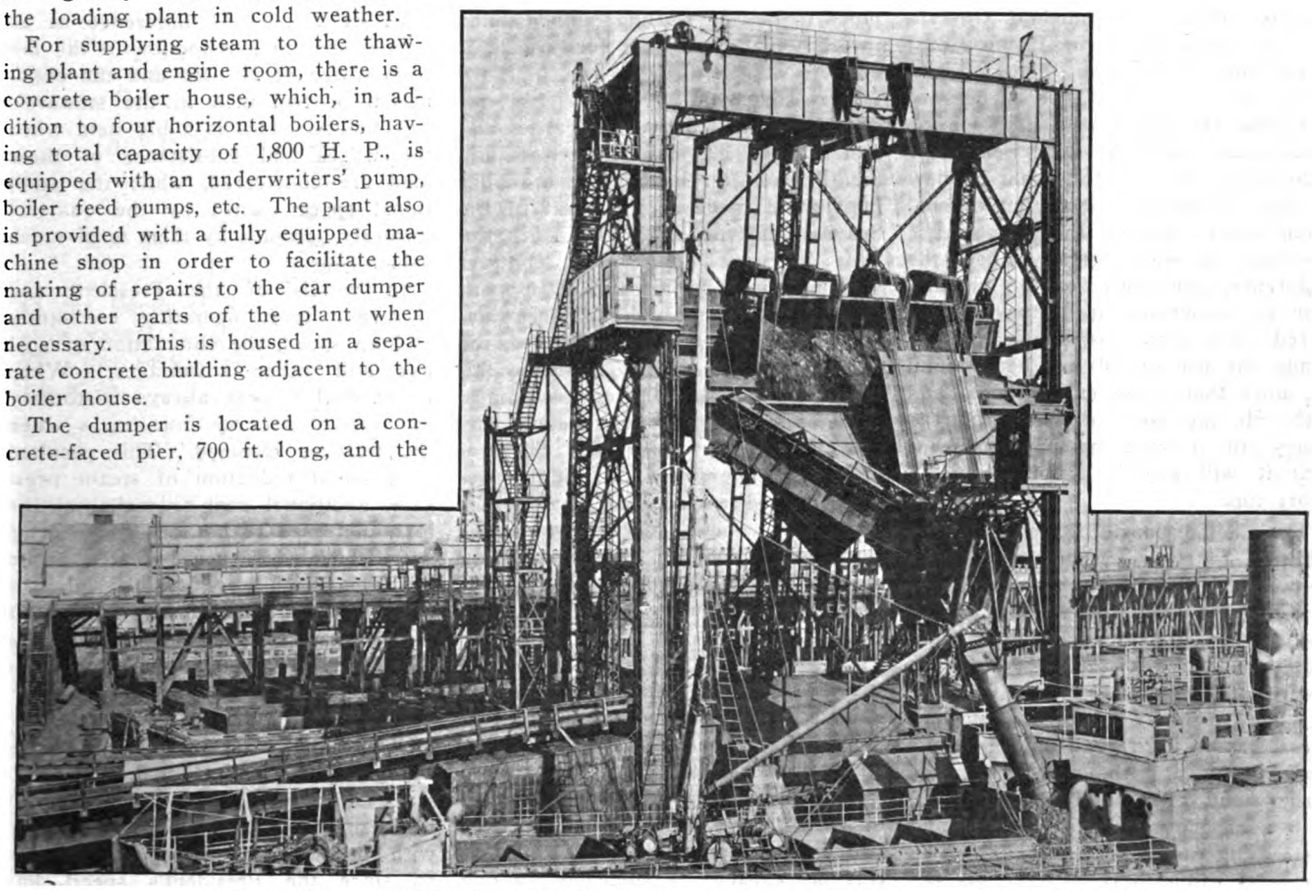


FIG. 3—COAL DUMPER AT GREENWICH POINT, SHOWING CAR COMPLETELY EMPTY

Gatum Locks as Dry Dock

The locks at Gatum were recently used as a dry dock in which to overhall five submarines. The five vessels, each 105 ft. long by 16 ft. in maximum beam were lashed together in one rank, side by side, and handled in a group. The movements of the group were controlled by means of four towing lines, two attached forward and two aft, each line being handled by from 10 to 12 seamen of the division, walking on the lock walls.

The draft of the vessels in salt water is 14 ft. The floor of the intermediate level of Gatum locks is 13 2-3 ft. below sea level, and the chambers may be filled to that depth with sea water. In order to avoid unnecessary operations of gates and valves, the lower gate of the middle level was thrown open directly after the operating gate at the lower end of the lower level was closed, making one chamber, 2,000 ft. long; this was filled a few feet and the vessels were towed into the intermediate level. The lower gate of this chamber was then closed, and the chamber was filled to a level sufficient to float the vessels into the upper level and in place over the cradles which had been prepared on the floor. The lower gate of the upper level was then closed and the water was let out slowly through the culverts under the floor, allowing the vessels to settle into place in their respective cradles. In the upper east chamber, the shorter, or 400-ft. section, was used.

The bulk freighter W. D. Crawford, building at the Lorain yard of the American Ship Building Co. for the Virginia Steamship Co., managed by M. A. Hanna & Co., was launched on April 18. The Crawford is built on the Isherwood system and is 524 ft. long, 58 ft. beam and 30 ft. deep and will carry 9,000 tons.

Converted Into Oil Burners

A Number of Vessels on the Pacific Coast Have Undergone These Alterations

UNUSUAL interest attaches to the conversion into oil burners of two of the fastest express passenger steamers plying the Pacific coast, the steamships Governor and President, of the Pacific Coast Steamship Co.'s fleet. The significance of this is that the owners of the steamships also own and operate large coal mines, but after extensive experiments it was found that in view of the demand for the output of coal from other sources, the convenience of using oil would greatly offset the difference, and therefore the installation of oil-burning apparatus was ordered. The change is significant. Already the use of oil has been found to more than meet expectations, and although the cost of installation is heavy, the owning company believes that it will pay for itself within a short time.

The Pacific Coast Steamship Co. in addition to the Governor and President, last fall brought the new steamer Congress from the Atlantic coast, she having been launched last May from the yards of her builders, the New York Shipbuilding Co., Camden, N. J. Originally planned the Congress was to burn coal, but the plans were altered and the new vessel was turned out as an oil-burning liner, with a capacity for 7,500 barrels and a steaming radius of 4,200 miles. The Congress came to the Pacific via the Strait of Magellan last summer, and the use of oil was found extremely satisfactory and economical. She made the run from Philadelphia to San Francisco in 57 days, including stops at Trinidad and Taltal for replenishing the oil supply. Not once during the long run was it necessary to stop the engines on account of the fuel supply, and since arriving on this coast the big steamer, whose speed is 18 knots an hour, has been operating without the slightest trouble. Within a few weeks, however, the vessel will be withdrawn for some minor alterations, which will be done at the plant of the Seattle Construction & Dry Dock Co.

At the present time the steamship Governor, which is of the same type as the Congress, but slightly smaller, is being converted into an oil burner, the work to take from 45 to 60 days, costing from $30,000 to $40,000. The Governor's capacity will be 5,600 barrels, giving her a steaming radius of approximately 3,150 miles. The big liner will carry her fuel supply in the double bottom from which it is piped to the big settling tank installed in the place of the forward coal bunkers.

The steamship President has resumed service between Seattle and San Diego, via San Francisco and San Pedro, after having had a similar installation made at the plant of the Seattle Construction & Dry Dock Co. This job was done on a contract working time of 35 days. In both vessels the Dahl high pressure mechanical system has been installed, the work including all the necessary alterations and the placing of pumps, heaters, strainers, gages, meters, etc. The President, which holds the record of 47 hours and 30 minutes between San Francisco and Seattle, has given much better service since she returned to the run, the installation of oil having added an average of one knot an hour to her speed.

Round Voyage Every Two Weeks

The steamship route from Seattle to San Diego and return via the usual ports of call measures 2,623 miles, and these fast steamers make a round voyage in two weeks, including a stay of three days on Puget sound and two days at San Francisco. Their oil carrying capacity is sufficient for one and a half round voyages, but upon each call at San Pedro the oil tanks are filled up. This is done while the vessel is handling cargo, and involves no loss of time. Previously, the express liners took coal at the Seattle bunkers each voyage, carrying on an average of 1,350 tons for the round trip. This coaling operation required nine hours and usually included several hours more of time wasted. Cargo could not be handled while coaling, so that the saving of time alone is no inconsiderable item, considering that these vessels are operating on a very fast schedule.

Another advantage of the use of oil is the increased cargo space due to the elimination of the coal bunkers. In each of the three vessels mentioned the added cargo space amounts to 600 tons, thus greatly increasing the earning capacity of the liners.

One of the best features of the oil-burning system is the reduction of the engine room crew in both the President and Governor. Formerly the President carried a crew of 136, whereas she is now operated with a total of 115. This difference of 23 men is due to a reduction in the fire room force of 21 men and the elimination of two men in the steward's department. This is a big item when the wages and subsistence of these men are considered, while the additional space gained by the quarters formerly occupied by them is of much value.

In vessels of the President and Governor type, operating constantly at high speed, the elimination of coal has still other advantages. When using coal it was always customary to clean fires every four hours when the watches changed. This resulted in a slight reduction of steam pressure, additional coal to make up the loss, increased revolutions to keep up speed and consequent greater strain on the machinery. With oil the steam pressure is steady and it is found that the machinery operates more steadily and smoothly with less wear and tear.

Considering all these advantages, including the lesser fuel cost for each voyage of oil against coal, the operating officials of the Pacific Coast Steamship Co. are greatly pleased with the change. Especially is this so since the President's speed has been increased and it is expected that when the Governor returns to service next month she will show similar improvement. The engine room crew now numbers 23 as against 44. The Governor was built in 1907 at Camden, N. J., by the N. Y. Shipbuilding Co.

Subsidiary companies of the Pacific Coast Steamship Co. own and operate large coal mines adjacent to Seattle, but the output is in great demand and the loss of the business formerly sold to the steamships has been overcome by demand in other directions. The conversion of these large passenger liners is believed to mark the last stand of coal on this coast where oil has superseded the use of coal in more than 90 per cent of the coasting vessels.

Many fine vessels have been changed from coal to oil burners at the yard of the Seattle Construction & Dry Dock Co. during the past year.

The Admiralty Formula

Mr. E. A. Stevens Jr. Evolves a Substitute for the Admiralty Formula

AT THE December meeting of the Society of Naval Architects and Marine Engineers, E. A. Stevens Jr. presented a paper on "A Substitute for the Admiralty Formula", abstracted thus:

This formula was derived from the Admiralty formula as follows:

$$\text{I.H.P.} = \frac{D^{\frac{2}{3}} \times V^3}{C} \quad \text{or} \quad V = \sqrt[3]{\frac{\text{I.H.P.} \times C}{D^{\frac{2}{3}}}}.$$

$$\text{Now } D^{\frac{2}{3}} = \frac{D^{\frac{6}{3}}}{D^{\frac{4}{3}}} = \frac{D^{\frac{6}{3}}}{\sqrt{D^{\frac{4}{3}}}}.$$

As the length of vessels of similar models varies as $D^{1}/_{3}$ L (or length LWL) was substituted for this factor, which gives

$$D^{\frac{2}{3}} = \frac{D^{\frac{6}{3}}}{\sqrt{L}}.$$

Now substituting this value of $D^{2}/_{3}$ and taking C out of the radical we get

$$V = C \sqrt[3]{\frac{\text{I.H.P.} \times \sqrt{L}}{D^{\frac{6}{3}}}}.$$

In order to simplify the formula $D^{2}/_{3}$ was replaced by D.

Tables Nos. 2, 3, 4 and 5 show the values of C as worked out for several types of vessels.

Tables Nos. 9 and 10 and Plates Nos. 3 and 4, give, the writer believes, a very fair comparison of the relative accuracy of the new formula and the Admiralty formula.

By simple solutions of the formula for values of its various terms it appears that for ships of

(1) Same length and displacement, power varies as V^3.

(2) Same length and speed, power varies as D.

(3) Same speed and displacement,

$$\text{power varies as } \frac{I}{\sqrt{L}}.$$

In presenting the formula, the writer does not claim that it is an accurate means for estimating the speed of ships, but merely one that can be used for preliminary calculations in place of the Admiralty formula with more accuracy. It is also easy to handle and requires less judgment and experience in its application.

In reading the paper, Mr. Stevens said:

You will notice at the bottom that the Utah is mentioned twice, one with reciprocating engines and one with turbine engines. The one with turbines is the actual results from the trial trip while the one with reciprocating engines is a supposed ship fitted with propellers of equal efficiency to the Delaware. This would give about the power required to drive her had she been fitted with reciprocating engines and propellers of the same efficiency as the Delaware. It is the same way with the curves on plate No. 3. The curves there for the Utah were from the trial results on Table No. 9, and we notice that the indicated horsepower of the Utah was taken from her effective horsepower and divided by the propulsive coefficient of the Delaware, so as to do away with any error due to propulsive coefficiency. I might also state that the degree of accuracy of the calculations is only that which can be attained on a 10-in. slide rule, as it would be impossible to work the thing out other than with a slide rule.

Tribute to Mr. Stevens

David W. Taylor:—This is the twenty-first general meeting of our society, so I presume the society may be regarded as having attained its majority, and I should like to note in connection with this paper what seems to be an appropriate circumstance. I believe this is the first instance in which we have had a paper presented to us by the son of a member from whom in the past we have had numerous invaluable papers, and I hope we will also have many more in the future.

Mr. Stevens, I think, has made a distinctive improvement on the admiralty formula. I also think it needs improvement. The trouble was with the original admiralty formula that it deals with a question in which there are a number of variables involved, speed, power, displacement, the proportions, dimensions, etc., and it is impossible to satisfactorily cover a question involving so many variables when, as in the admiralty formula, you select only three—speed, displacement and power. Mr. Stevens has introduced the length, which is a very essential factor in the power required for a given speed, and in that way I am sure he has made a distinct improvement. I think also it is an improvement to put the coefficient as the first power of the speed instead of as the indicated horsepower—that reduces the coefficient and makes less discrepancy between coefficiencies. The result, of course, is really the same.

The Chairman:—When the idea is to interfere with a good old friend like the admiralty formula there should be some champions for it. Has it any friends at all? We have a family pride in having this son of one of our members bring out his first paper, and we want to have good discussion upon it, if it is possible.

E. H. Rigg:—The chairman asked if the admiralty formula had not a champion. Mr. Taylor gave me the hint. He complimented the society upon the fact that we had the son of one of our distinguished members reading a paper. I think we must remember that the admiralty formula was gotten out by our fathers when they had not the facilities we have, and had not the experimental model basins which we enjoy. The admiralty formula has been very useful, and served a useful purpose in its day. We do recognize its limitations, and it is gratifying to have an improvement in that formula which we can take on with it.

I would also like to draw your attention to the fact that Mr. Stevens makes use in his paper of the ratio which Constructor Taylor uses in his manual, which you probably all know, and which does not need any flowers from me. Mr. Stevens uses the displacement-length ratio. To my mind that introduces a very important element in the accuracy of his formula. Moreover, it is good to see everybody working along a uniform line for technical expressions. If you undertake to study works on problems, you will find you have to look out for a lot of things; people use nearly the same terms, but not quite. I think it is gratifying that Mr. Stevens follows up with one of Mr. Taylor's expressions.

Fulton Diesel Oil Engine

A New American-Built Machine of the Four Cycle Type Designed to Operate on Low Grade Fuel Oils

DURING the past year the Fulton Mfg. Co., of Erie, Pa., have brought out an oil engine operating on the straight Diesel principle. The accompanying cut gives a good idea of the general arrangement. The engine is on the market in three sizes, viz., 3-cylinder, 50-horsepower; 4-cylinder, 70-horsepower, and 6-cylinder, 100-horsepower. The engine operates on the well known 4-cycle principle, has an 8-inch bore and 9-inch stroke, developing 50-brake-horsepower at 400 revolutions per minute. The starting handle and control wheel are shown at the left, and a two-stage air compressor at the extreme right. There is a battery of pumps for cooling water, fuel, crank case lubrication and bilge, mounted on the crank case at the compressor end.

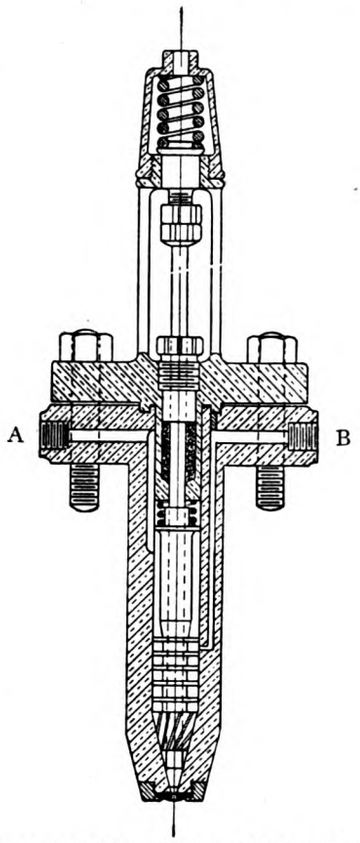
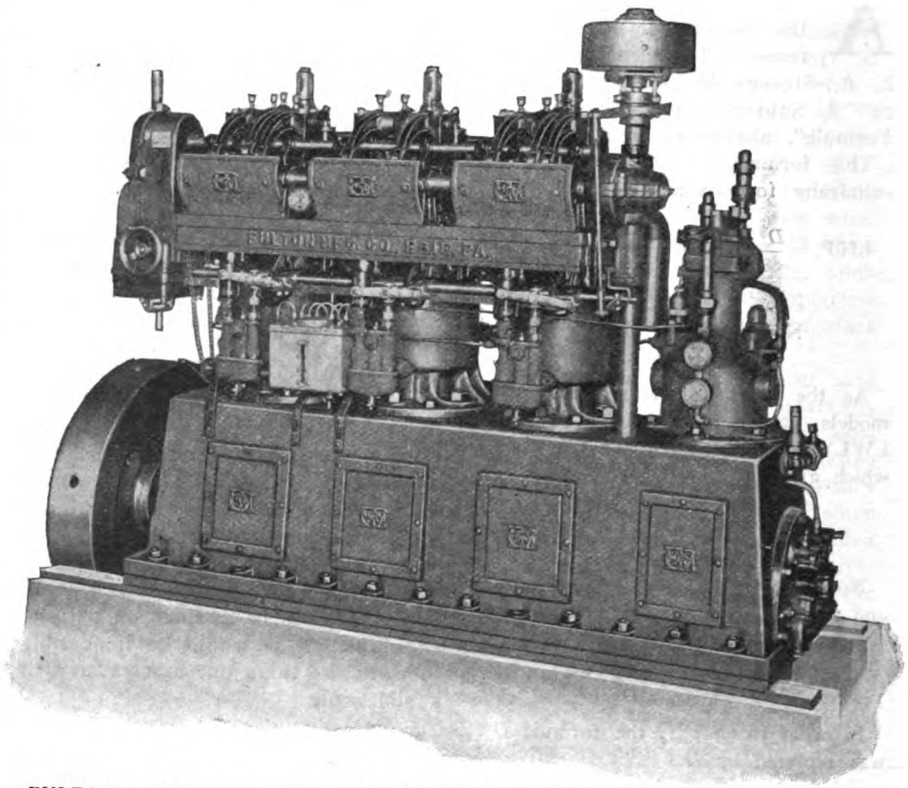


FIG. 1—FULTON DIESEL FUEL INJECTOR. AIR IS ADMITTED AT "A" AND FUEL AT "B"

The cam shaft is mounted on a continuous support, which is bolted to lugs cast on the cylinders. The parts are so arranged that each individual cylinder, or head, may be removed without dismantling the cam shaft. Hess-Bright ball bearings are provided for the gear end of the cam shaft, also for the vertical shaft, each of the bearings running in a bath of oil. The cam shaft is driven by means of helical worm gears from the crank shaft.



FULTON 3-CYLINDER, 8-IN. BORE BY 9-IN. STROKE, DIESEL OIL ENGINE. THIS ENGINE IS OF THE 4-CYCLE TYPE AND DEVELOPS 50 H. P. AT 400 R. P. M.

The 6-cylinder engine is practically two 3-cylinder engines coupled together. the cam shaft and crank case being made in two parts and joined at the center. There have been some changes made since the original engine was built, such as the arrangement of fuel pumps, location of governor and drive for the force feed oiler. There also have been some changes made in the air compressor to facilitate the assembling of the intercooler for the first stage air. There are patents pending on some of the apparatus shown in the cuts, which show a construction that is original.

Fig. 1 shows the construction of the fuel injector. Fuel is delivered to the chamber of the needle valve by the fuel pump, and the atomizing is accomplished by forcing the oil through the perforated discs of the atomizing arrangement shown at the bottom of the injector. The high pressure air from the receiver is coupled at *A*, and the fuel pipe at *B*. When the needle valve is slightly raised from its seat by action of the roller on the fuel cam, oil is admitted to the combustion chamber, where it is ignited by the heat of compression. By separating the upper from the lower part of the fuel injector, the same may be removed from the head without disturbing the fuel levers.

A spring at the top of the injector holds the needle valve to its seat. Renewable burning plates are held in position by a cone-shaped nut, which is locked in the cylinder head when the injector is in place.

Fig. 2 is a section of the fuel pump for a 3-cylinder engine, having a displacement plunger for each working cylinder. During the suction stroke, fuel is admitted to the pump chamber at *A*. During the delivery stroke part of this fuel is by-passed through the control valve; upon the closing of this valve the remaining charge is delivered to the working cylinder through the delivery valve.

The speed of the engine depends upon the amount of fuel delivered to the

working cylinders, and the control valves are regulated by the action of the governor. To accomplish this timing, an oscillating cam is rotated at cam shaft speed, and the effective movement of this cam is dependent upon the position of the control shaft, which is attached to the governor. Each of the control valves are independently adjustable, and are accessible by removal of the shield from the bottom of the pump.

Means are provided to render each of the fuel pumps inoperative by holding open the suction valves, which are connected to the push buttons of the control. The pumps may be operated by hand without disconnecting from the power drive by means of the eccentric mounted on the cam shaft, which has a loss motion of about 45 degrees. With this arrangement the fuel pipes and injectors may be primed subsequent to starting the engine.

Fig. 3 shows the air compressor and the general arrangement of the high and low pressure valves, also the coil for the first stage cooler. Air enters the large cylinder at the strainer of the duplex suction and delivery valves, is compressed and delivered to the intercooler for the first stage, thence to the suction valve in the high pressure cylinder, where it is compressed and delivered to a second cooler, then to the high pressure receivers. The compressor is capable of handling more air than is required for fuel injection, and this surplus is stored in two large receivers for starting. The fuel injection air is carried at from 800 to 1,000 pounds pressure per square inch, and the air for starting is from 700 to 1,000 pounds per square inch. One bottle should be sufficient to start the engine three or four times, but a second bottle is carried, to be used only in case of emergency.

After removing the cover, the cooling coil may be inspected without breaking any pipe connections or dismantling any other part. Renewable seats are provided in both high and low pressure air valves.

The cooling of the low pressure air valve is particularly efficient, in that in addition to the casing being completely surrounded by water the incoming air being drawn through the center of the delivery valve has a decided cooling effect. Both the high and low pressure valves can be removed for inspection or renewal without breaking any of the pipe connections.

Fig. 4 shows a governor of the fly ball type, having outside adjustment. All the moving parts are fully enclosed in a stationary cylindrical case, which has a detachable cover. The governor casing is bolted to the top of the crank case, and the moving parts are mounted on the vertical shaft, allowing the engine to be run with the governor parts exposed, if desired.

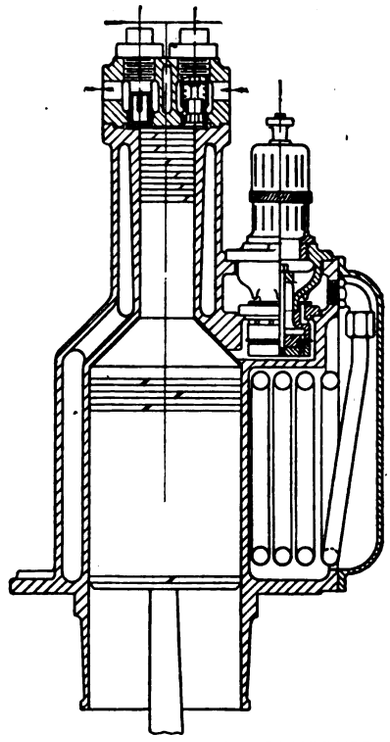


FIG. 3 — FULTON AIR COMPRESSOR, SHOWING GENERAL ARRANGEMENT OF HIGH AND LOW PRESSURE VALVES, AND COIL FOR FIRST STAGE COOLER

The end of the governor arm is attached to the control shaft of the fuel pump and has a range sufficient to rotate the control shaft enough to get the full range of regulation for the control valves.

Fig. 5 shows the wrist pin fastening. The pin is milled to receive a key in the usual manner, the piston provided with a key way, and the key and pin together, are assembled with the piston; a holding screw with its point projecting into the key keeps both the parts from moving endwise. The screw is held from turning by a lock washer. The pin is stepped to facilitate assembling with the piston. This method is both simple and inexpensive and as all the members are locked it cannot fail to give satisfaction.

Fig. 6 shows the construction of the oil strainer for the crank case lubricating system. No explanation is needed, except to say that the perforated cover is made in two pieces, in order that they may be removed when the filtering elements are to be cleaned. The strainer is installed by placing the cone seat in position and forcing the pawl spring at the opposite end to compression, letting the unit drop to place, as shown in

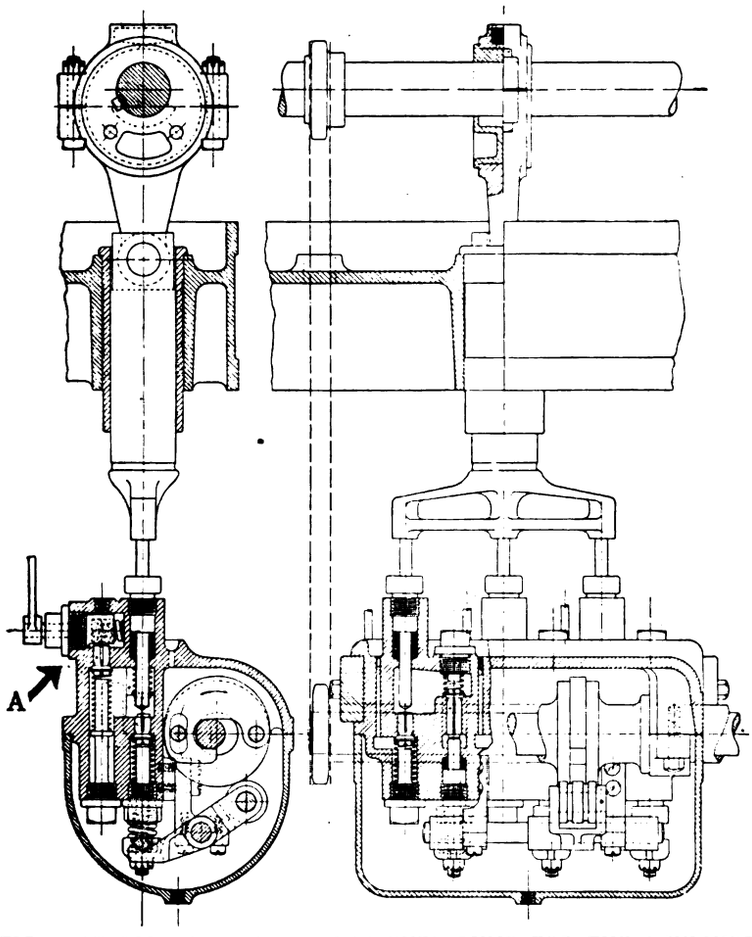


FIG. 2—SECTIONAL VIEW OF THE FUEL PUMP FOR THE 3-CYLINDER FULTON DIESEL ENGINE HAVING A DISPLACEMENT PLUNGER FOR EACH WORKING CYLINDER

the cut. The strainer can be removed by forcing the end containing the pawl out of the bracket, there being no permanent pipe connections.

For main bearing lubrication the crank shaft is drilled through its entire length

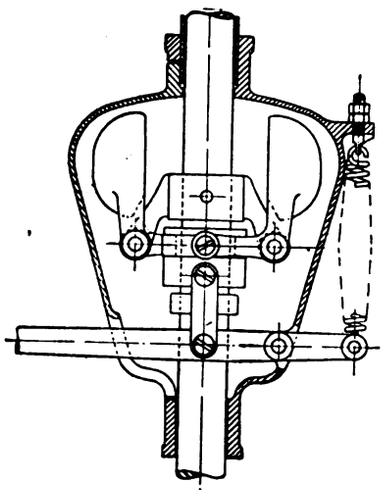


FIG. 4 — AUTOMATIC GOVERNOR OF THE FLY BALL TYPE, HAVING OUTSIDE ADJUSTMENT

and a small self-priming rotary pump forces oil to all crank shaft bearings and wrist pins.

A greater quantity of oil than is needed for lubrication is supplied, but there is no waste, as the oil flows back to the crank chamber, where it is filtered and used over and over again. This method not only gives ample lubrication, but has a decided cooling effect on the bearings. The system is provided with an overflow valve, and the pressure is normally held at 15 pounds per square inch, and a gage, so located as to be

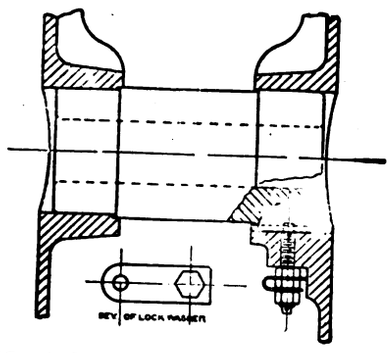


FIG. 5—METHOD OF HOLDING THE WRIST PIN IN THE PISTON

readily observed by the operator, leaves nothing to chance in this respect.

A force feed oiler is provided for the cylinders, there being two feeds for the working cylinders and one feed for the air compressor. This insures constant and even lubrication. As the entire oiling system is automatic in starting and stopping the chance of forgetting to open or close a device is eliminated.

The control arrangement consists of a handle and hand wheel supplemented by interlocking push buttons and provides the operator with every necessary means for starting and stopping. The starting handle has three positions, viz., "air start", "running" and "barring".

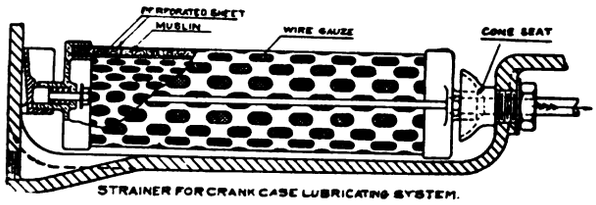


FIG. 6—SHOWING CONSTRUCTION OF THE OIL STRAINER FOR THE CRANK CASE. THE PERFORATOR COVER IS MADE IN TWO PIECES, TO FACILITATE CLEANING

The interlock is so arranged that with the handle in "air start" position, fuel and starting air cannot reach a cylinder simultaneously.

The fuel on the "air start" cylinders must be by-passed before placing the handle on "air start" position. When "barring", all fuel must be by-passed, so that fuel oil cannot flood the cylinders. The hand wheel serves to put more or less load on the governor by increasing or decreasing the tension of the spring, thereby regulating the engine speed.

Pumps are provided for cooling water, lubrication, bilge and fuel supply. These are located on the front end of the crank case and have a common drive. The center shaft is arranged to receive a crank and all the pumps may be readily primed without danger to the operator, as the crank is automatically detached with the starting of the engine.

The pumps are made interchangeable, so that one may be substituted for another, *i. e.*, the bilge pump can be connected to the cooling system, or the fuel supply may be attached to the lubricating system. As the holding screws of the pumps are all accessible from the outside the pumps may be removed without the necessity of working inside the crank case.

Fig. 7 shows a typical card taken from the engine in test. The compression was 520 pounds per square inch. The mean effective pressure was from 90 pounds to 100 pounds, depending on the load. Combustion was perfect, the exhaust absolutely colorless.

The engine was tested coupled to a water brake, and developed 50 brake-horsepower. Pennsylvania fuel oil was used, the consumption being slightly less than ½ pound per horsepower per hour. When the engine is run on overload the only noticeable difference is the amount of cooling water required. The engine is now installed in the maker's factory at Erie, Pa., to furnish power for running the plant.

Miscellaneous Data

Norton & Son, steamship agents and brokers, Produce Exchange building, New York, announce that John J. Farrell has been admitted as general partner. Edward N. Norton has retired and the business will be continued under the name of Norton, Lilly & Co., of which the only partners are Skeffington S. Norton, John B. O'Reilly, Joseph T. Lilly and John J. Farrell.

The annual meeting of the officials and captains of the Shenango Steamship Co. was held in the Rockefeller building, Cleveland, on April 7. Harvey D. Goulder addressed the captains on safety and efficiency.

The new 15-cu. yd. dipper dredge Gamboa, contract for which was awarded in January, 1913, to the Bucyrus Co., Milwaukee, arrived at Colon March 18, and has been put to work in the Culebra cut.

John H. Bernhard, Denegre building, New Orleans, La., who has been

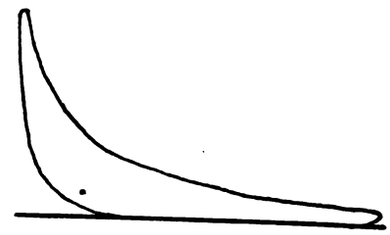
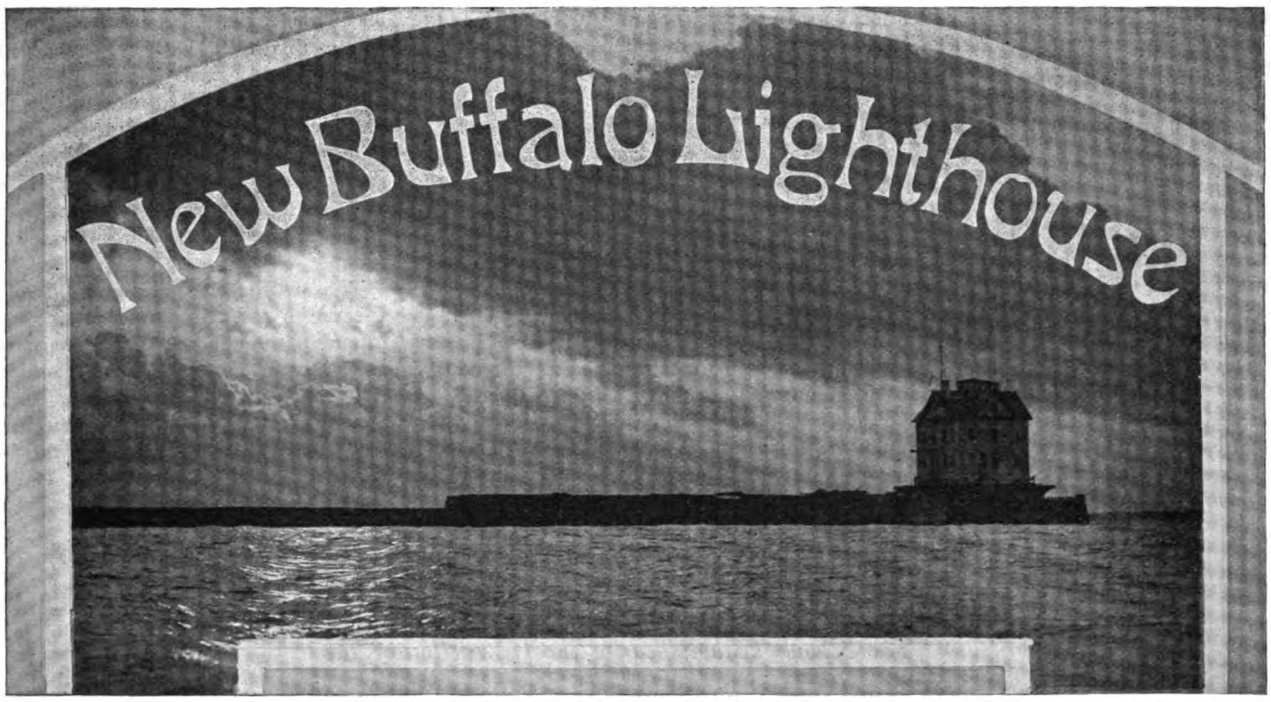


FIG. 7 — INDICATOR CARD TAKEN FROM A FULTON DIESEL ENGINE IN TEST

for some time past associated with the construction of steel barges for the Alabama & New Orleans Transportation Co. for service on the Black Warrior river, announces that he intends to construct a floating shipyard at New Orleans built up of ten units, each unit being 100 ft. long and 70 ft. wide. The company expects to start in a small way, perhaps with a single pontoon, adding, however, as the business grows. The pontoons will be constructed after the pattern of a dry dock, but having a self-contained machine shop.



THE NEW BUFFALO LIGHT IS OF 180,000 CANDLE POWER

THE recent completion of the new light station on the south side of the north or main harbor entrance begins a new chapter in the history of Buffalo harbor.

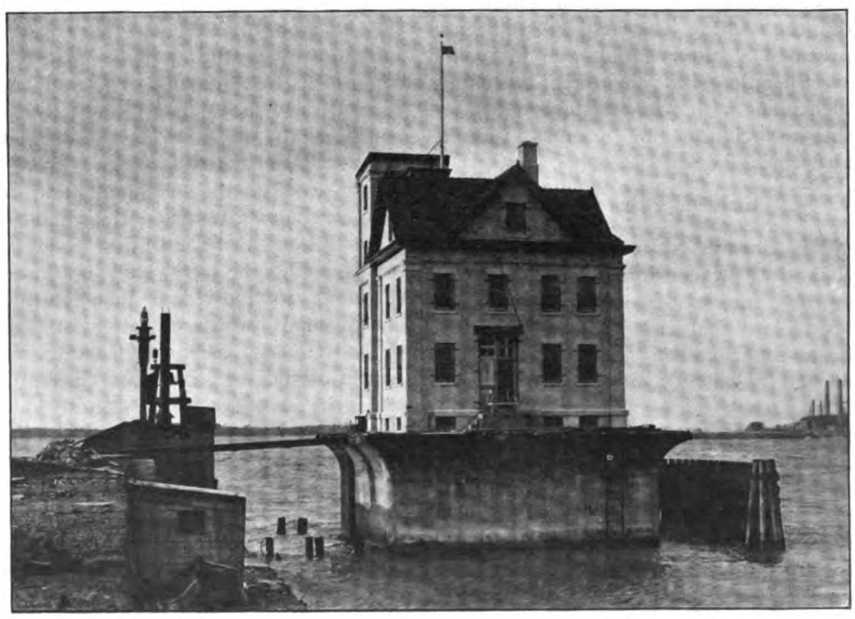
Buffalo's first lighthouse was built in 1820 and stood near the present life-saving station. In 1826 the north and south piers were built to protect the shipping, which increased almost miraculously in amount after the completion of the Erie canal, in 1825. During 1833 the light was moved to the stone tower on the south pier, and ever since that has been the main harbor light.

After the war, Buffalo harbor received almost the first attention of the government engineers, who recognized its great importance, and in 1868 the south breakwater was begun—a wooden crib filled with broken rock about a half-mile from shore. This might have been not only a safeguard, but a menace to navigation, had not a lighthouse been built near its south end (the site of the 1914 structure) in 1872—the first breakwater light.

In 1886, the wooden breakwater began to deteriorate and its reconstruction in concrete was begun. This was the first work of its kind in the United States, but proved highly successful and has continued in several stages and at intervals, until ultimately the whole breakwater will be rebuilt of concrete. The lighthouse crib also suffered from the elements at those points not continually submerged, and in 1899 the crib was covered with vertical plank to prolong its usefulness. The light (a fixed red of the fourth order) was raised 12 ft. at the same time, to a point 53½ ft above the mean lake level. Its lantern (or glass cabin sheltering the actual light and lenses) while on its temporary stilts, encountered one of the strongest winds in the memory of the oldest inhabitant and was given up for lost, but owing to the care and foresight of the men in charge, this $3,000 beacon was undamaged. In 1909 the steamer Frank J. Heffelfinger collided with the lighthouse, carrying away the overhanging deck, the davits, boat and landing ladder. In view of this and several serious accidents, a fender of piles has been erected to protect the new building.

The new light itself, which is to be the main harbor light, or "landfall", is of the oil vapor type, of 180,000 candlepower. It is a white, flashing (or intermittent) light, and owing to its elevation of 65 ft. above the lake level, will be visible from vessels 18½ miles away. On Lake Erie or Lake Ontario there is no other combination of light and lenses so powerful as this.

For the protection of vessels in thick weather, the first fog signal was erected on the breakwater in 1880. This was replaced in 1893 by a bell



A CLOSE VIEW OF THE NEW LIGHTHOUSE

and a 10-in. steam whistle, which so disturbed the citizens of Buffalo that the government was persuaded to build a deflector to the landward, which sent practically the whole sound out over the waters and relieved the ears of the land dwellers.

The fog signal of 1914, a diaphone, is the first of its kind in this country, the most modern and effective sound producer yet devised for this purpose. It is in type like a reciprocating siren and emits a sound that is highly characteristic and peculiar.

For a foundation the crib under the old lighthouse has been used. It is of wood filled with stone, extending down to the solid rock. The new construction began 4 ft. below the water line and concrete blocks weighing 15 tons each were first placed, to bring the structure above the lake level. From this point massive concrete walls enclosing the lower part of the steel work extend up to the main deck.

A Fine-Looking Building

A structural steel frame forms the skeleton of the building. This is faced with buff brick, trimmed with granite in order to be a distinctive landmark by day. In every respect this $60,000 building is thoroughly modern and up to date. The windows and doors are protected by steel shutters, for experience teaches that the water, at times, will be dashed clear over the top. The interior is finished in white, enameled brick for the most part, with hardwood floors. It contains the office, watchrooms, engine-room, three bedrooms, a kitchen, several storerooms and two bathrooms, with running, soft, hot and cold water.

The work was designed and inspected by Watts D. Gardner, superintendent, under the direction of Roscoe House, inspector of the tenth lighthouse district. Lupfer & Remick, consulting and contracting engineers, of Buffalo, were the general contractors.

Lake Carriers' Night Schools

The Schools Established for the Instruction of the Men Were Well Attended and Will Be Continued

DURING the past winter the Lake Carriers' Association conducted schools at Buffalo, Cleveland, Detroit, Marine City and Duluth for the benefit of the men aboard ship. A meeting of the instructors of the schools was held in the quarters of the Lake Carriers' Association, Rockefeller building, Cleveland, to report upon the season's work and to outline plans for the future. Harry Stone, chief engineer of the steamer Joshua W. Rhodes, had charge of the school at Marine City, H. R. Smallenburg at Buffalo, George A. Green at Cleveland, A. B. Moehlmann at Detroit, and Miss Anna Meinhart at Duluth. E. C. Collins, chairman of the educational committee of the Lake Carriers' Association, presided at the meeting and invited J. H. Sheadle, who has been intimately identified with the welfare work of the association, to address the instructors.

Make Licensed Officers

Mr. Sheadle stated that the things that they were doing were working in the minds of men all over the world to the end that there might be an improvement in material things. It had been thought wise to attempt some work along educational lines, and the schools established had been the outgrowth of that idea. It was not the expectation that any extravagant ambition would be realized, but that the work might eventually lead to the increase in the number of men desiring to seek positions as licensed officers aboard ship. The schools were intended to help them along in their specific work. Each of the teachers then related his experiences during the winter.

A very rare and noble quality was developed in the work of Harry Stone. Never having had a day's schooling himself, he was led into teaching in the hope that he might help those who were similarly handicapped. Though he has regularly sailed the lakes for 50 years, he has been a teacher for over 40. He said that he had 37 students during the winter, and 14 had obtained licenses. He dwelt upon the importance of insignificant incidents in teaching, illustrating his meaning by saying that in a class in writing he formed the capitals of Cleveland and Ohio backwards on the blackboard, and was surprised in looking over the papers after the school had adjourned to find that several of the pupils had covered pages of the paper with these capital letters all written backwards. In other words, the incident had arrested their attention and had excited interest. In addition to teaching evenings he also gave up his afternoons to individual instruction of those pupils who seemed most eager to learn. In answer to question from Mr. Collins, he said that he could take the average oiler employed on lake boats and with two months time, provided he applied himself, fit him to pass an examination for license as engineer.

"I greatly appreciate the unselfish interest that the Lake Carriers' Association is taking in the men," said he. "In improving them mentally you are not only improving them financially, but also in a moral and social way. It is in my judgment far better than profit-sharing."

He could not help contrasting present conditions aboard ship with those which obtained when he began sailing as an engineer on the steam barge Trader, running from Bay City to Toledo. When he wanted to sleep he wrapped his coat about him and lay down on top of the boiler. Today every possible comfort, including private bath, is provided.

Miss Anna Meinhardt, of Duluth, related the experiences of the Duluth school during the winter. The attendance began with 12 and gradually increased. In common with all the other instructors she found that arithmetic was easy and grammer difficult. She felt that a course of lectures once a week might help in increasing the interest of the pupils. She also thought that the average book on arithmetic contained a great deal of matter of no possible use to the pupils, and thought that it might be wise to compile an arithmetic for the exclusive use of the students.

A Big Class

H. R. Smallenburg, of Buffalo, had a class averaging 35 or 40. There was a wide difference in the needs of the men attending this school. Several of them could neither read nor write, while others might easily have been prepared for licenses. He said that the percentage of illiteracy in the United States is greater than that of any other country, and that usually the foreign element that apply for instruction, if unable to speak English,

are able to read and write in their native tongue. They rapidly pick up English and get along well. He thought that to give them a list of words that are in general use on board ship would be a definite help to them. He also testified that their interest was greatly quickened when it was pointed out to them that the school work would aid them in eventually obtaining licenses either as pilots or engineers.

George A. Green said that at the Cleveland school he had pupils that when enrolled could not add, but quickly progressed under individual instruction. He gave them quite a number of lectures on a variety of topics to stimulate their interest, and found that they were greatly interested. They were especially interested in simple problems of physics.

A. B. Moehlmann, of Detroit, had a most interesting class to deal with. The enrollment was about 50, embracing all nations. One of his most earnest pupils was a man 58 years of age, who is studying to get a license. He brought out a very interesting point when he spoke of the change in personal appearance of the men as the classes advanced. While at the beginning they were somewhat indifferent as to dress, towards the closing of the season they were really well groomed. He varied the work as the season advanced, in order to increase their interest, and frequently took them to clinics in order to see how bandages should be properly applied to wounds and to give visual instruction in first aid to the injured.

The instructors were requested to submit to the committee such recommendations for the enlargement of the scope of the work which their experience may have taught them to be wise.

Charles C. Galbraith, late of the Marconi Co., and Robert H. Armstrong have formed a co-partnership, April 1, under the firm name of Galbraith & Armstrong, and will act as agents for the Atlantic Communication Co. in the United States, Hawaiian Islands and Porto Rico, for the sole sale and rental of the Telefunken System of Wireless Telegraphy. Mr. Galbraith will take care of the affairs for the firm on the Atlantic coast, with offices at 47-49 West street, New York City, and Mr. Armstrong on the Pacific coast, with offices at 305-6 Crary building, Seattle, Wash. They already have contracts for the installation of the Telefunken system on thirty-one ships since they have embarked in the business for themselves as agents.

Rivers and Harbors Congress

By A. G. Wells, Director

All people interested in marine news, which unquestionably should include all readers of your valuable publication, should be conversant with, if they are not already, the purposes of that great organization known as "The National Rivers and Harbors Congress," and the magnificent work it is doing, for not only marine interests, but through that channel, the whole country as well.

The slogan adopted by the congress is "A Policy, Not a Project," for its intention is, not to promote the scheme of any individuals or combinations, nor to serve the interests of any particular section of our country, but rather by uniting the influence of people from all parts of this great nation, in one concerted and organized effort toward directing public sentiment; and through that,—greatest of all effective mediums—bring the importance of maintaining the present great "National Waterways", and of improving the many others that are not only possible but feasible, to call the attention of our national congress in such a manner, as will cause it to appreciate that there are few other things that our government can do, that promise so large, quick and permanent returns for the money invested. It can be truly said that all work competently done in this direction, is a wise investment and not an expenditure.

Certainly, next in importance to the improvement of the highways of our country, stands the betterment of its waterways, for everything accomplished in either line, greatly lessens the cost of transportation and brings the source of supply of our natural resources and hidden wealth, nearer to the great markets of the world, which are calling for them.

Water transportation, especially for heavier commodities and to be carried long distances, is by far the cheapest form known, and besides its direct advantages, through actual savings, in case of moving freight, on that which is transported in that way, there is the indirect, but even greater advantage because of its influence as a regulator of freight rates.

Everybody who has the opportunity to use our present waterways knows this to be a fact, and what it already does for such, will be done for all, as fast as the many projects already started or contemplated become accomplished facts.

While this country has greater natural waterways than perhaps any other, it has not as yet made the use of them that many others have, but as the importance of these great possibilities become appreciated, more will be done, and the aim of the National Rivers and Harbors Congress is to disseminate the facts of its importance as widely and rapidly as possible.

Much good work in this direction has already been done, through its instrumentality and it is being rewarded by largely increased appropriations from congress for that purpose, and at the same time they are seeking to encourage the work being done as effectively and economically as possible.

One of their principal objects is to adopt a policy of securing regular and continuing appropriations for this work, in order to avoid the uncertainty which always exists when left for each congress to act upon, and to be used as a medium through which to barter political favors, and also to be expended entirely under the control of our government's engineering department, against which there is not a suspicion of anything but honor and loyalty to our country, so that a project once begun, may be completed in the shortest possible time.

To the marine man, whether he be an owner or sailor of craft of any kind, or in any other way directly interested in marine matters, this movement is of immediate and special importance, and such people as are interested, should be hearty and loyal supporters of the congress by giving it their influence, through membership in the great organization, attendance at its deliberations if possible, or at the very least, by becoming a subscriber to that most beautiful and interesting magazine, the *National Waterways*, which is controlled, managed and edited by the congress itself, for the purpose of having an organ of its own with which to reach the people. The profit, if any there be, to be used solely to further and to broaden the scope of the organization's influence.

Raising the Maine from Havana harbor by the use of an elliptical cofferdam of interlocking steel-sheet pile cylinders cost $785,774.83, according to the recently published final report of the board of engineer officers, consisting of Col. William M. Black, Lieut.-Col. Mason M. Patrick and Maj. H. B. Ferguson. The total appropriations for this work amounted to $900,000. The first pile of the cofferdam was driven Dec. 6, 1910, and the last March 31, 1911. The wreck was floated, towed out to sea and sunk on March 16, 1912.

Lake Carriers' Association

The Directors Meet to Consider the Recommendations of the Fleet Engineers, Industrial Committee and Committee on Aids to Navigation

THE directors of the Lake Carriers' Association met in the Rockefeller building, Cleveland, on Thursday, April 23, to consider the recommendations of the Fleet Engineers' Association, the Industrial Committee and the Committee on Aids to Navigation, as drafted by them on Jan. 22 last.

Before proceeding to a consideration of the various items, Harry Coulby said that one of the finest things that had been brought about in late years on the lakes was the spirit of co-operation between the management and the men. The Lake Carriers' Association, he said, is an organization which deals only with things of mutual interest and has never been concerned with earnings. He thought it a splendid thing that the men were evincing such great interest and had put in so much time working out recommendations and he felt that if they were adopted by the association it was incumbent upon each individual owner to see that they were put in actual practice.

"I was greatly impressed with our Washington experience," said he. "That committee of captains made a great impression on the congressional committee. When I have gone there representing a moneyed interest very little attention has been paid to me, but these men who had practically climbed up through the hawse pipe onto the bridge were a mighty impressive lot. The committee knew instinctively that these men would not advocate anything that would imperil their lives and the property entrusted to them. I have been connected with the Lake Carriers' Association since it was formed, and looking back at things, we have certainly made wonderful progress. It showed great progress to be able to send such a committee of captains to Washington. Now these men have worked hard on these recommendations; they are trying to solve our problem for us, and if we adopt them we should individually see that they are enforced. We ought to feel gratified that we have developed such a spirit of co-operation among our men."

The first recommendation had to do with the scarcity of licensed second assistant engineers. Young men who hold a license of the grade of first assistant, even when limited to tonnage, prefer to lay ashore waiting for a position as first assistant rather than take a position as second assistant. After acting as firemen and oilers for a period of three seasons they are eligible for examinations for license, but as it is being worked out on the steamers at the present time the men do not get enough practical experience in the engine room to make them competent to fill the position of first assistant engineer, whereas after coaching by a competent instructor they are able to pass the examination before the local inspector. It was the opinion of the chief engineers that such young men should not get better than second assistant licenses on their first issue.

President Livingstone was directed to take the matter up with the supervising inspector general of the steamboat inspection service to see if anything could be done along this line.

Internal Inspection of Boilers

It is the practice of the board of supervising inspectors to withhold all publicity of its action in regard to inspection laws until after the subject has been submitted to the secretary of commerce. This of course works quite a hardship because obviously the only way relief can be obtained from a measure unintentionally oppressive would be to ask that it be rescinded. It was deemed by the fleet engineers to be advisable that a competent committee be appointed to make up a set of rules for inspection of steamers on the great lakes and have them presented for consideration.

No action was taken on this except to suggest that memoranda be made of individual and specific cases of hardship which could be submitted to the inspectors.

Last season in Chicago the inspectors insisted on the internal inspection of boilers at the regular annual inspection. One case mentioned was that of a modern boat which had been in commission only a short time and although everything on the boat was in good condition the vessel was detained 48 hours in making the inspection under the new rules. In addition to the usual hydrostatic test of boilers the inspectors are now insisting upon an internal inspection as well at all ports. There is no objection to the internal examination, but the fleet engineers feel that it should be made after the boats have laid up at the end of the season or before they go into commission in the spring. This recommendation was approved and President Livingstone was instructed to take it up with the department.

There is some talk of compelling owners to put all the boilers down on the tank tops. In all new construction they are so located and it was not believed that the contemplated measure would be retroactive.

Owing to the fact that the inspectors are usually extremely busy inspecting vessels in the spring, the fleet engineers felt that there was delay in examining young men for licenses, whereas there is frequently a great demand for licensed young men aboard ship. They felt that the local inspector should be in his office ready to examine applicants at all times and that enough assistant inspectors should be employed to examine the vessels.

The fleet engineers will be instructed to report specific instances in which young men have found it impossible to be examined.

The recommendation that a life line be stretched from the dunnage room forward to the boiler house, about 3 ft. above the tank top on side hopper ships and about the same height as the main stringer on the older construction of ships, was heartily approved with the amendment that the distance might be anything between 3 and 4 ft.

The recommendation that instructions be given to all ships that no hatch bars or other material be stowed along the side hopper tank tops or the main stringers, as men are liable to stumble over them, was also approved.

This concluded the recommendations in so far as the Fleet Engineers' Association is concerned.

The Industrial Committee complained that some of the recommendations made at their meeting on March 10, 1913, for the prevention of accidents on ship board had not been carried out during the past year by some of the vessels, and believing that they are practical, urged that they be reprinted for the information of the vessels. This was carried.

The practice of using a mixture of gasoline and oil in torches for lighting purposes was prohibited.

It was recommended that the inside of hatch coamings be painted white.

Dock companies will be instructed not to allow their men on board until notified that the vessel is ready for the men, owing to the danger that they run of being injured by the cables that are used to take off the steel hatches.

The recommendation that temperance should be encouraged and be made a consideration for promotion as between men of otherwise equal merit was heartily approved, as was also the recommendation to prohibit the carrying of liquor aboard the vessel. Temperance pledges and buttons will be provided for free distribution to the men in the assembly rooms and aboard the vessels.

It was recommended that all water tanks for sanitary use aboard vessels should be so constructed that they could be easily got at and cleaned, and they should be filled through independent pieces of hose and not through regular pipes. In other words, they cannot be filled with hose that is used for swabbing down the deck because such hose may have been used in water from a possibly polluted area.

Considerable attention was paid to the following recommendation: "That the masters and engineers of all vessels in the association be instructed to have the dynamo run so that the ship can be properly lighted at night whether working or not; that the dynamo be run in the day time when in the judgment of the masters and engineers it is necessary."

It is generally known that the dynamo is a frequent source of friction between the forward and after end of the ship. It was felt that the responsibility for its operation should not be divided and the recommendation was amended to read as follows:

"That the masters of all vessels having dynamos be instructed to have the dynamo run when in their judgment it is necessary for the proper lighting of the ship."

Wherever practicable or necessary for safety, proper foot gratings and hand rails will be placed athwartships above the boilers, the gratings to run full length between the boilers on all boats.

No attempt shall be made to remove a bonnet from a valve until the steam line on which the valve is situated has been opened to the atmosphere. Repair work of any kind is to be avoided whenever possible on boilers or pipe lines while the same are under pressure.

The vessels of the association will carry cards bearing the words "Safety First", or language to the same effect, in all dangerous places on board ship. The vessels of the Cleveland-Cliffs Iron Co. already indicate these places with a blue enamel sign and those of the Pittsburgh Steamship Co. with a red disc. The disc is in general adoption on all the railroads of the United States. It was decided to combine the two, having signs on both forward and after deck houses and in the engine room accompanied with the red disc.

The committee recommended that the Lake Carriers's Association bring its influence to bear upon the proper authorities having jurisdiction over marine boiler construction to have all boilers constructed in the future in such manner as to allow as much as possible the further examination of the internal parts.

The recommendations dealing with the filling of the drinking tanks and the care of the toilet facilities were referred to the committee on sanitation.

Money-Saving System

The committee recommended the money-saving system to those who have not availed themselves of this convenience. In this connection Mr. Sheadle stated that a bank account had an undoubted steadying influence and that there was a direct ratio between the changes in crew and the size of the bank account. Fewer shifts are made by the money-saving element.

The committee strongly endorsed the holding of monthly meetings of licensed officers aboard ships and recommended that they be held on the vessels that have not so far followed this practice. It was the testimony of those managers on whose vessels monthly meetings are held that it has been one of the best features ever introduced and that some of the reports that are sent into the office are regarded as invaluable.

Before proceeding to the consideration of the recommendations of the Committee on Aids to Navigation, L. C. Waldo recommended that a few cases of food be always carried forward for use in cases of emergency. He recommended this as a result of the experience of the crew of the L. C. Waldo in the storm last November. The after deck house was completely swept away by the sea and for 72 hours the crew had nothing to live on except one can of tomatoes and two cans of peaches. This recommendation was referred to the Industrial Committee.

The Committee on Aids to Navigation recommended that the Livingstone channel, which is now 300 ft. wide, be increased to 450 ft. This was endorsed.

The committee endorsed the request made by the lake survey for $175,000 to carry on the work of surveying and charting the great lakes. An additional appropriation for making a thorough survey of the southern end of Lake Huron and also the Nine Fathom Bank in Lake Huron was recommended. This was, of course, approved.

It was recommended and approved that the following signals be universally recognized on the lakes as distress signals and should be used only in case of distress and when assistance is needed:

By day—four long blasts of the steam whistle and the ensign hoisted up-side down. At night—rockets sent up and exploding in the air and emitting red stars. The firing of a gun at frequent intervals or four blasts of the steam whistle. If none of these are at hand, then the burning of an oil barrel or some inflammable material will be used to attract attention.

W. E. Lloyd proposed an amendment that the rockets be the regulation government four-pound ship rockets and that each lifeboat be provided with a regulation government distress outfit, consisting of 12 pyrotechnic red lights carried in a metal case. Mr. Lloyd stated that life boats of the Mutual Transit Co.'s fleet had been so provided for years and his amendment together with the character of the signals was approved.

Searchlights were held to be of no material benefit in aiding safe navigation and that for the purpose of picking up a derelict crew or a man overboard, water lights were far more practical.

The masters of the committee who command vessels with steel hatches having three athwartship bars and three windy youngs considered them very secure fastenings, and those masters of the committee having vessels with hatches secured with butterflies also considered them very secure, but in the latter case wooden battens, 1 in. x 2½ in. wide should be placed along the forward and after end of the upper side of the hatch upon which the butterfly fasteners are to be tightened.

It was recommended that reliable barometers should be furnished to all vessels and that they should be period-

ically taken to the weather bureau for correction.

It was also recommended that all owners of Lake Carriers vessels should supply at least one reliable clock—a Chelsea or one of equal merit. This was approved.

It was also recommended that all vessels of the association be equipped with water lights to be attached to the ring life buoys and ready for immediate use.

Water-tight tubular tin cases will also be carried for the purpose of floating a last message ashore should a vessel be lost.

It was recommended that all ships be fitted with storm oil tanks and this was heartily approved.

The committee recommended that the policy of having a wheelsman stand a three-hour watch at the wheel and three hours on the lookout, which has been in effect on about 50 per cent of the Lake Carriers vessels, be adopted by all of the vessel owners of the association and insist upon its being carried out on the boats.

There was considerable discussion on this recommendation, Mr. Lloyd stating that it did not help them in the package freight trade, though they had endeavored to observe it. Mr. Coulby felt that the day of a six-hour watch at the wheel was about over. The lakes is practically the only place in the world where such a practice is followed. He also thought it was a great benefit to vessel owners in that it made four wheelsmen forward instead of two. He felt, however, that conditions were somewhat different in the package freight trade and should be recognized, but Mr. Lloyd said he was not prepared to say that he wanted the package freighters eliminated and was willing to try the three-hour watch for another year. The recommendation was then approved.

The committee reported that the rule on inside and outside courses, which had been given a thorough trial, was a good one, and recommended that it be carried out by all the vessels in the association, as it would tend to make navigation on the lakes safer. It was felt that if it was generally followed there would be less danger of vessels meeting, and it was accordingly adopted.

Mr. Coulby then asked Harvey D. Goulder, counsel, whether a vessel coming down on the inside course and colliding with an upbound vessel would suffer a handicap in court by reason of that fact. Mr. Goulder held that the vessel would be handicapped because it had not observed custom.

The outside courses are designated as follows:

Lake Superior

1. Draw a line on your chart from point of departure to point 6 miles north of Devil Island, thence to a point 10 miles north of Copper Harbor, then to Whitefish.

Lake Huron

1. Draw a line on your chart from Detour passage to a point 10 miles east northeast of Thunder Bay Island light (this will be about 8 miles off Presque Isle light). Thence from this point off Thunder Bay Island light to a point 10 miles off Harbor Beach, thence to Lake Huron light vessel.

2. All down-bound ships will keep to the northward on Lake Superior, and to eastward on Lake Huron of these lines, and all up-bound ships to the southward on Lake Superior and to the westward on Lake Huron. Up-bound ships should give the line a good margin of leeway. The only exception that should be made to this rule is when in the judgment of the captain he deems it wise to deviate on account of heavy weather.

3. That boats coming out from the Straits of Mackinac and downbound should continue on their course from Nine-Mile Point until they have arrived at the intersecting point of the down-bound course on Lake Huron, before attempting their course down the lake.

The various aids to navigation recommended in the way of buoys, lights, etc., were turned over to President Livingstone to obtain government action as opportunity presented itself. The list embraced a number of improvements which probably will not be obtained for several years. President Livingstone in his general talk, however, indicated that the Livingstone channel should have fixed lights as navigators as a rule are more or less afraid of this channel after dark. In a tentative way the subject has also been broached of a new channel for downbound boats from the head of Russell Island to Lake St. Clair on the American side, which would, of course, eliminate the dangers of the southeast bend.

Mr. Coulby felt that it should be impressed upon all captains to report to President Livingstone instantly any lights out or misplaced that they may discover. Should 50 or more such reports enter the president's office regarding a single light, it could not fail to have an impression upon the department.

Mr. Sheadle in closing referred to the work which the Lake Carriers' Association is attempting to do and dealt particularly upon its present campaign for sanitation. He also desired the members to appreciate that everything that is being undertaken is for their own personal interest, that the things contemplated are all economic and economic to the vessel owner's advantage. He felt that if the various circulars which the association is sending to the boats were treated merely as literature, that they would fall 90 per cent short of the mark. They should receive the cordial and enthusiastic support of all owners. This point was also emphasized by President Livingstone, who thought that all such information should be accompanied with a personal letter from the owner.

Especial attention was directed to a circular calling attention to the necessity of shipping men through the assembly rooms and Mr. Sheadle felt that there should be back of this the deep personal interest of every owner. He said that he would like to see every man stand up and give it his personal endorsement and all did so to the man.

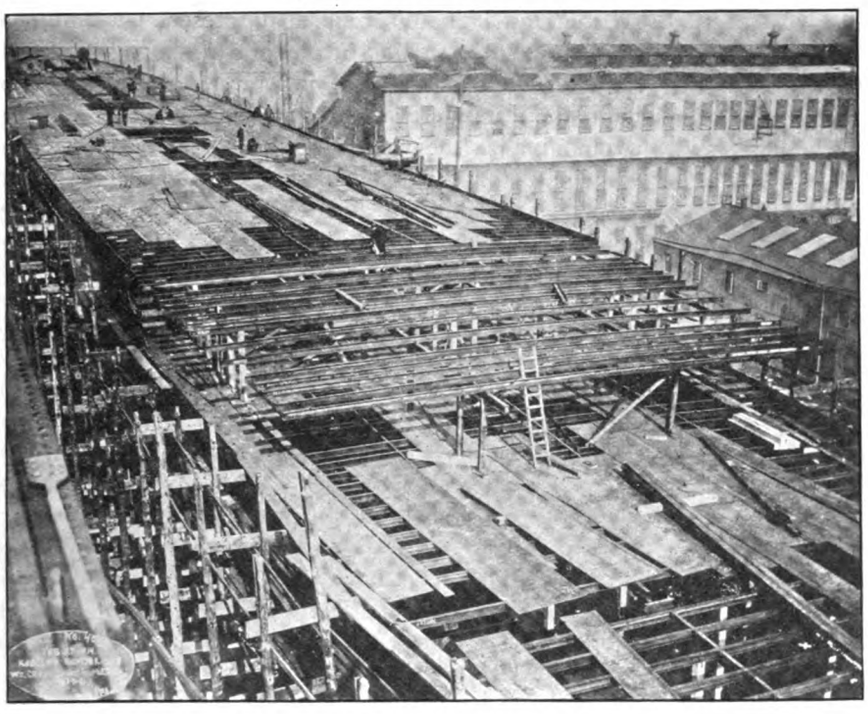
In closing, Mr. Coulby said it was not so much the matter what anyone else was doing. The question before each one of them was as to what they were doing themselves. He addressed himself especially to the younger element present and told them that he knew from experience that they were up against a stiff proposition, but he hoped that they would keep everlastingly at it because the results to be achieved were certainly much to be desired.

Those present were: William Livingstone, L. C. Waldo, Detroit; Harry Coulby, J. H. Sheadle, Harvey D. Goulder, George Marr, J. Burton Ayers, R. A. Williams, George Steinbrenner, J. S. Ashley, John T. Kelley, A. F. Harvey, O. C. Canfield, A. E. R. Schneider, Charles L. Hutchinson, Walter M. Williams, Archie Thompson, A. T. Kinney, Capt. Stewart, R. D. Mitchell, W. D. Becker, of Cleveland; W. E. Lloyd and John Boland, Buffalo; Capt. D. Sullivan and W. H. Smith, Chicago; W. M. Mills, North Tonawanda; John Craig, Toledo; W. D. Dyer, Pittsburgh.

In dredging the Columbia river bar channel the scraper-suction dredge Columbia is reported to be handling sand at a cost to the government of 2½ cents per cubic yard. It would be interesting to know whether interest, maintenance and depreciation are included in this figure.

New Hill Steamers

Herewith is published the first photograph of the Hill steamship Great Northern, now building at Cramps', Philadelphia, for service between Astoria, Ore., and San Francisco, Cal. A sister ship, the Northern Pacific, is also under construction. The Great Northern will make the trip from Philadelphia to the Pacific coast by way of the Panama canal and will be one of the first of the Pacific mer-



CONSTRUCTION VIEW OF THE HILL STEAMER GREAT NORTHERN NOW BUILDING AT CRAMP'S

chant marine to make the voyage through the canal. Both boats will be in service in 1915 to share in the travel between the Oregon and California coasts in connection with the exposition. The boats will be 526 ft. long, 63 ft. beam and 21½ ft. draught. They will have accommodations for more than 800 passengers besides 1,500 tons of freight.

Charts of Panama Canal

The fact that the Panama canal is approaching completion and that a large number of vessels will undoubtedly avail themselves of this short route from the Atlantic to the Pacific, has been anticipated by the department of commerce in the publication by the United States Coast and Geodetic Survey office of a series of charts of the canal and its approaches.

The general chart of the Panama canal and approaches, No. 94, which has recently been issued, is on a scale of 1/146,000 or one-half inch to the nautical mile, and is in colors. The canal is colored dark blue and the ocean waters a light blue; while the region of the canal zone is colored a light pink tint and the territory of Panama is given a pale buff tint. The soundings are given in feet. The tidal data is for mean low water springs in the gulf and bay of Panama and mean low water in the Caribean sea and Limon bay. The mean higher high tide at Colon is only 1.2 feet above the tidal plane and the lowest tide 2 feet below that plane. At Balboa the range of tide is much greater, the mean higher high water being 14.5 feet above the plane of reference and the lowest 4 feet below it. The surveys on which this chart are based were made by the Coast and Geodetic Survey in 1905 and 1912, but surveys made by the Isthmian Canal Commission and information obtained from other sources have also been utilized. The lighthouses and buoys for the aid of navigators in the approaches to the canal are shown and their characteristics indicated. The elevations on land are given in feet above high water. There are two compass roses and a border scale on the chart. The magnetic declination in this region is given as 4 degrees 25 minutes east in 1915, with an annual decrease of 1 minute.

This chart, besides its usefulness for purposes of navigators, will also be of interest to the large numbers of tourists who visit or pass through the canal.

Through With Excavation

The dry excavation for Culebra Cut was terminated on March 31, when the three 95-ton steam shovels now engaged in lessening the pressure on the east Culebra slide, north of Gold Hill, will be withdrawn from their pits and made ready for dismantling. The crews of the shovels and of the dump trains which have handled their spoil will be discharged, effective April 1, on account of reduction of force.

Dry excavation at the bottom of the cut was discontinued on Sept. 10, 1913, on which date 13 steam shovels were engaged on high levels at various points. The number has since been gradually reduced as the work was completed. In the latter part of November, six shovels remained; two of these, on the west bank at Culebra, were withdrawn in December. Since that time, the dry excavation has been confined to the Gold Hill slide. Four shovels were working until the latter part of February, when one was withdrawn. The completion of the dump near New Culebra station, on which the spoil was wasted, and the general condition of the Gold Hill slide, have led to the decision to abandon the use of all the shovels.

Fireproof Ships

In the house of representatives, Mr. Edmons has introduced a bill (H. R. 15431), providing for the construction of passenger vessels of fireproof material. The bill recites that on and after Jan. 1, 1915, the building of all ships or steamboats or other craft used for the transportation of passengers for fare, whether propelled by the use of coal, oil, gasoline, or any other fuel, shall be subject to the following regulations: (1) The hull and all the superstructure, including decks, cabins, doors, windows, partitions, roofs, floors, and berths, shall be constructed of a material which is fireproof. (2) It shall be the duty of the bureau of navigation (or proper licensing officer) to refuse a license for any boat to carry passengers the keel of which boat shall have been laid on or after Jan. 1, 1915, unless this act is complied with. (3) This act shall apply to excursion boats, ferries and passenger boats, whether navigating lakes, rivers or in coastwise traffic. (4) Boats carrying fishing parties which are not over 20 tons burden are excepted.

George L. Armes, engineer-in-chief of the Union Iron Works, San Francisco, is visiting eastern yards.

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May, 1914

Lack of Preparedness

Rear Admiral W. W. Kimball, United States Navy, retired, issued a statement through the Navy League that is full of common sense.

He points out the present position of the United States on the eve of the opening of the Panama canal with relation to its merchant marine, indicating the great sums of money that are constantly being earned by foreign vessels which carry the products of American industry.

He takes as his text the situation which existed at Seattle during the Boer war, when the foreign trade of that city was completely demoralized through the withdrawal of foreign vessels for war purposes.

"Were a general European war to withdraw the vessels of Germany, Great Britain, France and Italy, the trade of the whole nation not only would suffer as did Seattle," he said, "but would be entirely without transportation facilities at any price. When the American business men awake they will give us a commerce of our own based upon an American merchant marine. They will change us from a lopsided, tribute-bearing community to a great symmetrical, independent nation, a maritime nation owning and controlling its maritime affairs that will teach us, the great American super-intelligent people, what the general run of British Tutons and Latins in Europe already know, namely, that no nation with a seaboard can be a real nation without a commerce—without sea power. The awakened business man of national business sense will grasp the patent fact that a real commerce will financially benefit the farmers in Kansas more than the fishermen in Gloucester."

That last sentence puts the whole situation in a nutshell. If the farmers in Kansas could only get that into their heads this country would have a self-contained merchant marine.

The trouble is that Kansas is so far from the seaboard that the people lack the imagination to comprehend that ships are necessary to their continued prosperity. Our products over consumption must be sent abroad or industry will stagnate in this country, but Kansas, and we mean by Kansas all of the interior states, have not been able to grasp that fact as yet. If the United States occupied its present position, contained its fine wealth of mineral resources and was no bigger than England, it would have a whale of an American merchant marine, because every citizen would realize the vital necessity of having one. The necessity is just as vital today, but a considerable part of the inhabitants are blinded by our physical bigness. The time is coming when this lack of preparedness on our part will result in great national humiliation.

Dullness in Lake Trade

Lake trade has never been duller than it is at the present moment. The lassitude which began to effect the iron business shortly after midsummer last year was not appreciably felt on the lakes during last season, the movement of freight being the heaviest on record and at fair prices. It was inevitable, however, that the slack would have to be taken up and certainly is being taken up hand over fist. It is about the only thing that is being taken up. While navigation has been open practically since April 20, few vessels are moving. There is no ore in sight and the movement during May will undoubtedly be light. Leading shippers will not be in the market for tonnage during May and the ore movement will accordingly not be well under way until June. There will be a wide difference between the amount of ore brought down by July 1, and the amount that was brought down for the corresponding period last year. Vessels that are holding storage coal are reluctant to deliver it, as there are no down cargoes available. For that reason coal tonnage is scarce, even though the number of cargoes offering are few. Various predictions place the ore movement at from 10,000,000 to 12,500,000 tons less than that of last year. If the general movement of vessels is deferred, however, until well into June, this subtraction will be practically absorbed and the season from that time on should be a good one for the vessel owner, as there would be moved in the time remaining about as much freight as was moved in the corresponding period last year.

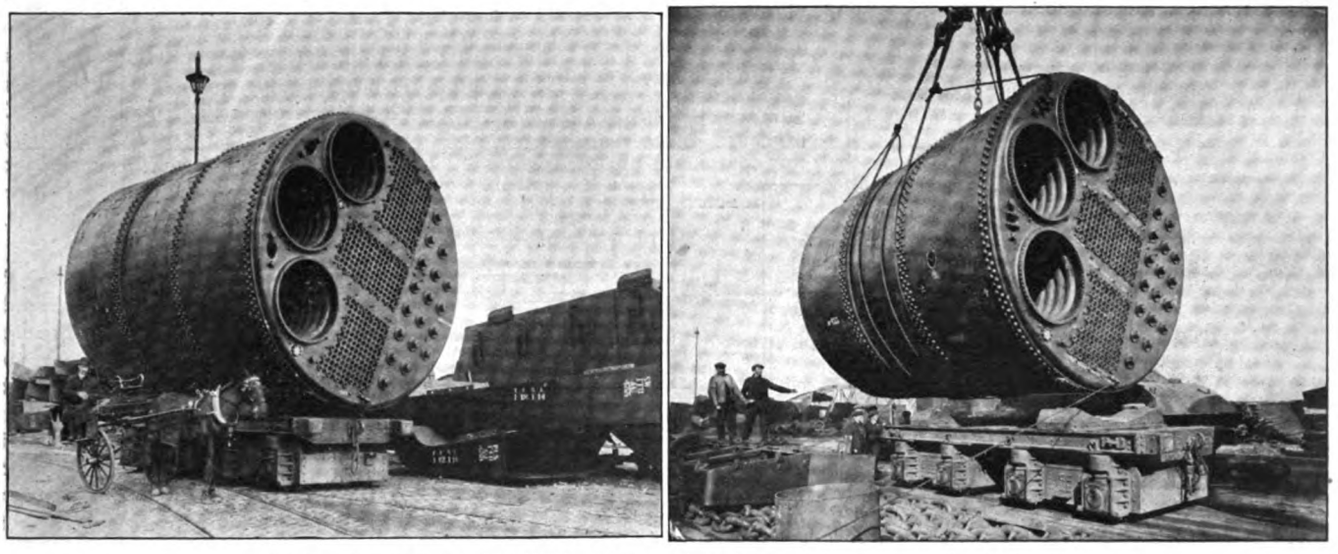
About $400,000,000 is what the Panama canal has practically cost the American people. Our whole oversea merchant marine on the Pacific coast consists of six vessels, namely, the Manchuria, Korea, Siberia, China, and Mongolia, of the Pacific mail fleet, and the Minnesota, of the Great Northern Line.

Britannic's Boilers

The 29 huge boilers of the 50,000-ton White Star liner Britannic, now under construction at Belfast, have just been placed in position. Twenty-four of these are double-ended and five are single-ended, all being designed for a working pressure of 215 lbs., which has been found entirely practicable under natural draught conditions. Owing to the Britannic's great breadth, it has been found possible to arrange five boilers abreast except in No. 6 boiler room, where because of the increased fineness, only four could be fitted. All the double-ended boilers are 15 ft. 9 in. in diameter, weighing 105 tons each and are constructed of steel 1 11/16 in. thick, employing 159 furnaces of the Monson type.

The Britannic's boiler installation and the coal bunkers occupy six watertight compartments having a total length of 320 ft., the engine room taking 123 ft. additional.

The Britannic's engines, like those of Olympic, will consist of a combination of reciprocating engines with a low-pressure turbine of the Parsons' type. The superior economy of this system is due to the fact that increased power is obtained in the same steam consumption by expanding the steam in the low-pressure turbine beyond the limits possible in reciprocating engines, as has been proved in the voyages of the White Star liners Laurentic and Olympic.



TWO OF THE TWENTY-NINE DOUBLE-ENDED BOILERS OF THE BRITANNIC

Motor Coasting Vessels

For several months considerable interest has been centered upon the yard of Hawthorns Co., Ltd., of Leith, in which two full-powered motor coasting vessels have been in course of construction, namely, the Ila and Ife, both of which have been built to the special designs of J. B. Wilkie, superintendent engineer to Elder, Dempster & Co., of Liverpool. A number of motor coasters have been built in Scottish yards, but the Ila and Ife stand alone for unique design, they having quite left the barge class and entered the "ship" section.

Elder, Dempster & Co. came first into touch with the internal combustion engine proposition when they purchased the Itu, a vessel, length 59 ft. by 15 ft. by 4 ft., fitted with two sets of Bolinder engines, each developing 25 b. h. p. This vessel was followed by the Ibusa, fitted with an 80-b. h. p. two-cylinder marine oil engine of the same type. These boats were used to replace the steam craft carried by their ocean-going boats.

Leaving the small boat section, Elder, Dempster & Co. centered their attention on the larger type of craft. The result is the construction of the Ila and Ife, sister vessels, with length b. p. 135 ft., breadth moulded 25 ft., draught, carrying 300 tons of cargo, 7 ft. The cubic capacities of the holds and hatches of each vessel are close on 18,000 cubic feet, the hatches being of large size so as to carry bulky packages.

The hulls are of Siemens Martin steel throughout, and fitted with four watertight bulkheads. Loading is facilitated by four steel samson posts, which are fitted amidships, each having a separate derrick 32 ft. long, and capable of lifting two tons by single purchase. The above derricks are worked by two separate winches, driven by a 20 b. h. p. Bolinder engine, special arrangements having been made that either both the winches can be used at the same time or separately. A tow hook has been arranged for in a suitable position, as it is quite possible that frequently these may pick up a tow.

The machinery of each vessel consists of two sets of Bolinder direct reversible crude oil marine engines, each developing 120 b. h. p. at normal load, with a continuous overload of 10 per cent. The guaranteed consumption with these engines is approximately eight gallons per hour each, but under ordinary working conditions this power engine is stated to work on a considerably lower consumption, in some cases as much as 20 per cent lower, even when developing the full load at 275 revolutions per minute.

Fuel tanks with a capacity of 1,200 gallons, in addition to a daily service tank of 160 gallons capacity, with the usual connections to the main tanks are fitted in suitable positions in the motor-room, so as to give plenty of room round each engine. The speed trials of the Ila were run at Leith, when the satisfactory speed of just over 11 statute miles per hour was obtained. The owners immediately took delivery of the vessel, which will make the trip to its destination under its own power.

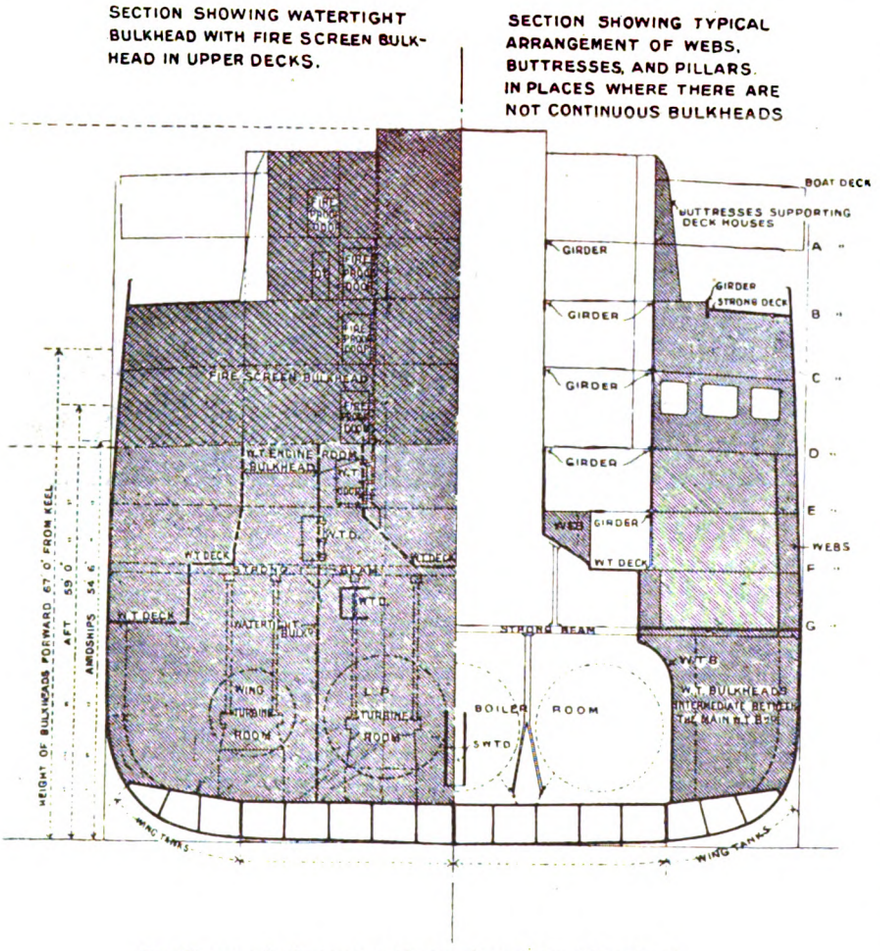
The steamer Louisiana went ashore on Lake Michigan last November and soon after stranding caught fire and was destroyed. The steamer was insured against fire and total loss and underwriters have been unable to agree on a settlement. Suit has been brought against all the Underwriters, Goulder, Day, White, Gary and McCreary, and the court will determine which set of underwriters will have to pay.

Design of Merchant Ships

The Question Discussed Before the Institution of Naval Architects from the Owners' Point of View

By L. Peskett

THE author sets out to analyze the influence exerted by shipowners upon the design and construction of ships, basing these observations upon 30 years' experience with the Cunard Steamship Co., and dealing mainly, therefore, with ships suitable for the North Atlantic trade. This trade is the subject of very keen international competition, and thus the owner has been willing to put to a commercial test the various improvements which have been made by the engineering profession. This has added other difficulties in determining the general features of new designs, one of these difficulties being that of estimating with accuracy for how long a period a particular type of passenger ship will run without becoming an economic drag. A fast vessel, primarily built for passenger service, can be made of little profitable use if converted into a cargo carrier. The accompanying table shows the general particulars of interesting vessels of the Cunard fleet, and at the same time indicates the rapid rate of progress that has been maintained by this premier line.



Sections of the new Cunarder "Aquitania."

Mr. Peskett enumerates the varying considerations that have to be taken into account in the initial stage of a design, which should be developed from the owner's experience and data, if the finished ship is to prove a successful commercial asset. The history of the Lusitania and Mauretania design is sketched. The splendid results of these ships on service speak for themselves, and indicate the judicious manner in which the available data were employed.

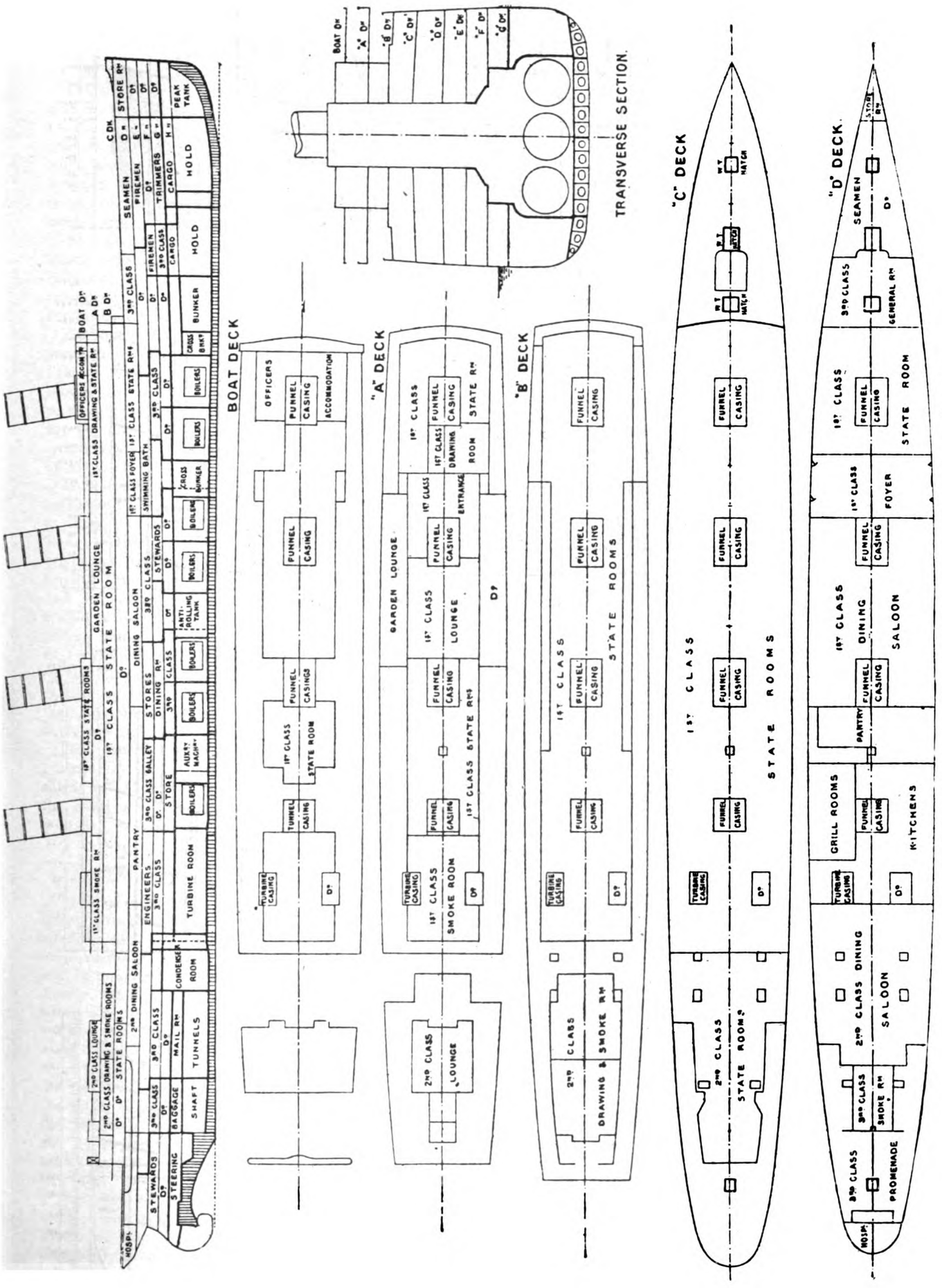
Referring to turbine machinery, the author draws attention to the bold experiment made by the Cunard Co. in building the Caronia and Carmania of equal dimensions, the former being fitted with quadruple-expansion reciprocating engines and twin-screws, running at 80 r. p. m., while the latter is fitted with compound turbine engines driving triple engines at 175 revolutions. The results of eight years' experience with these ships do not warrant the adoption of direct acting turbines to drive a ship of this type at a speed of 18 knots.

The considerations leading to the design of the Aquitania are extremely interesting. In this case the problem was that of designing a ship capable of working on the mail service with the Lusitania and Mauretania, and at the same time one that would make as much per voyage without subsidy as the express steamers were making with one. This involved the construction of a ship which could sail regularly from either terminal port once every three weeks, and not take longer than 5½ days on the voyage. For this purpose a speed of 23 knots was decided upon. The problem of earning the extra profit led to the increased dimensions of the new ship.

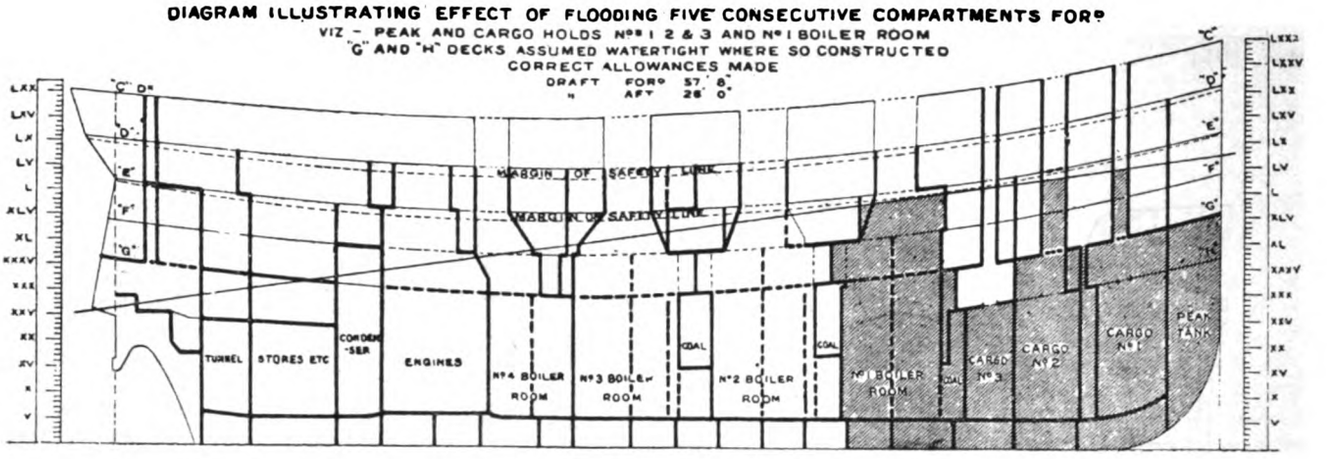
With regard to watertight subdivision, Mr. Peskett states that the Cunard Co. are satisfied that for ships of the type of modern high-speed liners a combination of longitudinal and transverse bulkheads is the best suited to their requirements, from the point of view of strength, safety, and convenience. In view of the interest attaching at the present day to the question of unsinkableness, the diagrams on page 198 showing the results of flooding under assumed conditions, are very instructive, and indicate that the question has been solved in this case. Intermediate ships do not lend themselves to this combination of longitudinal and transverse subdivision, and are most conveniently subdivided by transverse bulkheads only.

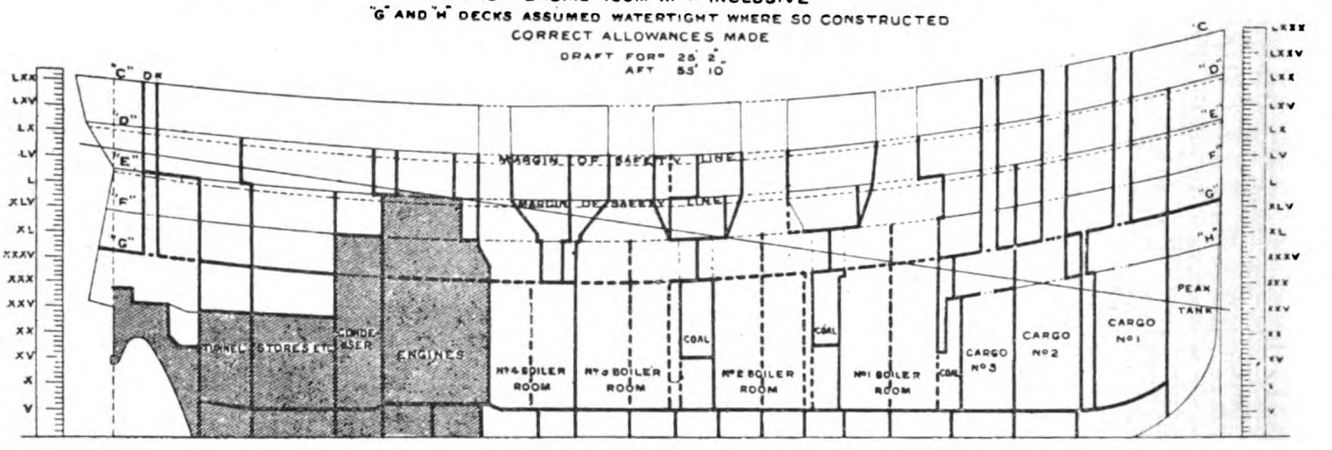
Scarcely less important than watertight subdivision is protection against

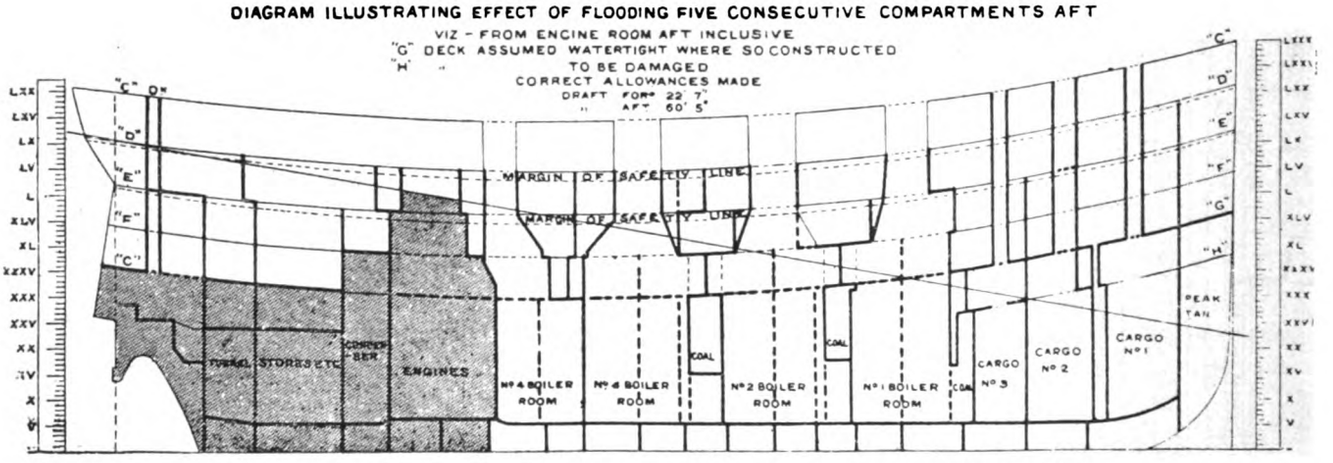
*Condensed from a paper read before the Institute of Naval Architects.



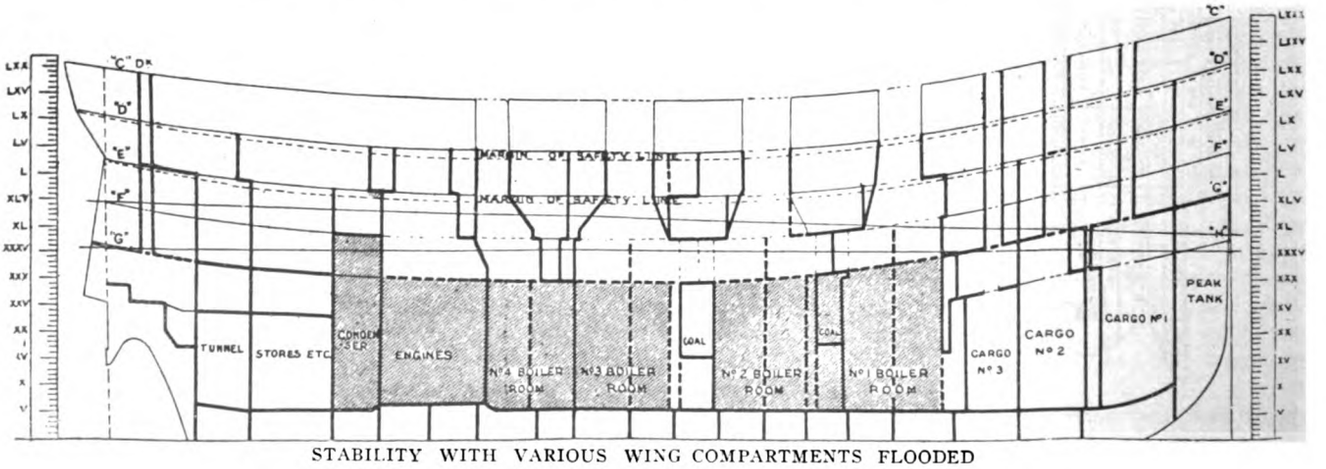
PLAN OF WATERTIGHT SUBDIVISIONS OF THE NEW CUNARDER AQUITANIA







Diagrams illustrating Effect of Flooding under Various Assumed Conditions.



STABILITY WITH VARIOUS WING COMPARTMENTS FLOODED

fire. The only feasible way of restricting fire in a ship is by vertical fireproof bulkheading. The means adopted for this purpose are shown on the annexed sections.

The problem of economical propulsion is one that is not solely confined to the matter of obtaining an economical prime mover. Often fuel economy means a larger engine, and hence a reduction of cargo capacity. It has been found that unless the distance between coaling ports exceeds 2,000 miles there is no advantage in fitting quadruple instead of triple-expansion engines. The author is not convinced as to the economy of the combustion system of machinery.

The question of stability is one of great importance. It is highly desirable in passenger ships that they should be comfortable, and comfort is largely measured by the metacentric height. This has been growing in recent years, although from the point of view of easy motion in a seaway it is desirable to keep the metacentric height in the loaded condition as small as may be compatible with safety. The relation between metacentric height and rolling period is now receiving more general consideration and is actually taken into primary consideration in the design of anti-rolling tanks. The Cunard Co. have experimented with the Frahm tank on the Laconia, and the results of this experience is the fitting of them into the Aquitania, in which case bilge keels are being dispensed with.

This paper is a very valuable contribution to the subject of design of ships, and shows how very much alive the naval architect of today has to be in order to keep up to date.

Direction of Sound

David Wright Smith, 212 St. Vincent street, Glasgow, is marketing a device intended to locate sound in fog. It is supplementary to the ordinary whistle and is intended to be sounded immediately after it on the approach of another vessel.

The direction of another vessel sounding this signal in fog can be at once located to a single degree. At the second or third blast the course of the other vessel can be deduced from the difference, if any, in the bearing, and the presence or absence of a dangerous position will thus be early determined.

The signal consists of a loud hissing sound, and the sound producer is shown at Fig. 1 overleaf. It is actuated by an ordinary stop-valve and lever and is fitted to a branch from the steam pipe supplying the whistle.

One striking advantage which this signal possesses is, that it will be hardly, if at all, returnable by an aerial echo; so that, if heard, it may

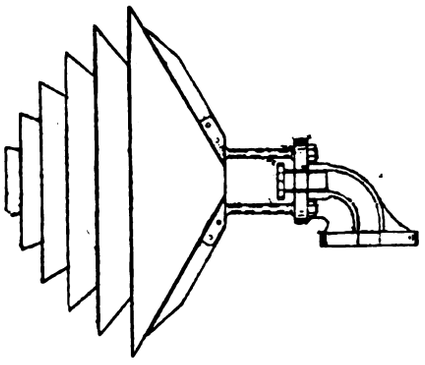


FIG. 1—SOUND PRODUCER, FITTED ON BRANCH FROM STEAM PIPE SUPPLYING THE ORDINARY WHISTLE

be taken to be proceeding direct from the source.

Two forms of receiver are shown. Fig. 2 is suitable for a bridge where the rail is covered with a wind screen. Fig. 3 is adapted for the top of a deck house. The concave reflector shown can be readily unshipped and stowed away when not in use, the pedestal with the indicating plate being a permenent deck fitting.

On a whistle being heard, the direction of which is required, the officer, having the ear pieces in his ears, grasps the handle, releasing the spring clip from the grooves on the under side of the brass indicating plate, and

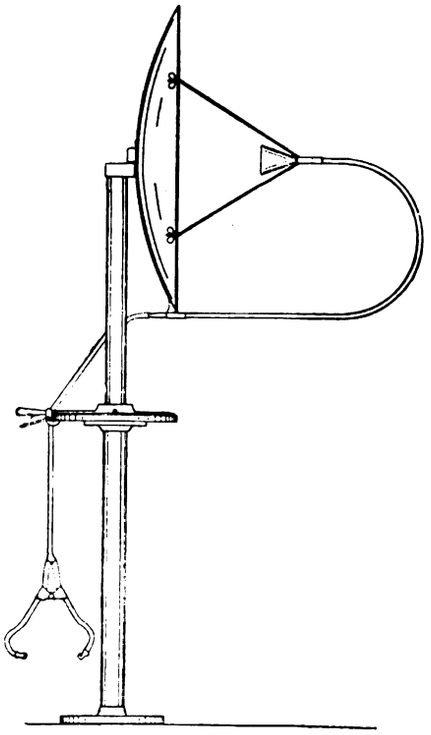


FIG. 2—SOUND RECEIVER FOR USE ON BRIDGE

swings the reflector rapidly through a few points of the compass, covering the direction from which the whistle is supposed to proceed. If the other vessel sounds the supplementary signal, the hissing sound will be heard through a small arc, and the clip will be released at the position of maximum intensity.

As the ear pieces block out the sound of the signal, except what comes through the ear tubes, the signal is not heard at all, unless the apparatus is pointing approximately in the direction of the sound source, and this fact makes a mistake as to direction impossible.

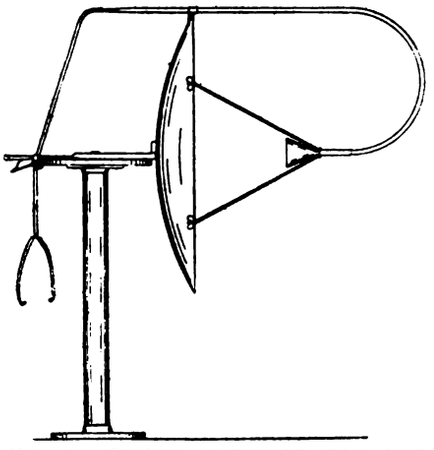


FIG. 3 — SOUND RECEIVER FOR USE ON TOP OF DECK HOUSE

The Great Lakes Protective Association, which carries 25 per cent of the insurance upon vessels enrolled in the association, has fixed the rate at 3½ per cent for the year, which is a reduction of ½ per cent from the rate obtaining last year. It is also ½ per cent lower than the rate established by the underwriters for the coming season of navigation. The association, however, hereafter, will not take a partial form of insurance, that is, insurance will not be written for total losses only or collision damage done or sustained. The valuation of the five wooden vessels enrolled in the association was reduced from $25,000 to $20,000 in each case, and the association will accept the rate fixed by the underwriters for this class of tonnage.

The Hartmann-Greiling Co., Green Bay, Wis., has been awarded a number of large boat rebuilding contracts, among them the construction of a new steel hull for the tug Bob Teed, owned by the Greiling Bros. Co.; new boilers and other improvements to the steamer Albert Soper, and general repairs to the steamer Frances Robbins, owned by the Becker Steamship Co., Cleveland.

Port of New Orleans

The Southern City is Endeavoring to Develop Its Commerce With South America—Relative Distances

REALIZING that New Orleans is the natural gateway of the greater share of the import and export trade of the Mississippi valley with South America, L. S. Goldstein, chairman of the Wholesale Merchants' and Manufacturers' Bureau of the New Orleans Association of Commerce, has inaugurated a campaign to develop this commerce through better steamship connections. The Illinois Central, Louisville & Nashville, Southern Pacific, Texas & Pacific, Queen & Crescent and other trunk lines are vitally interested in this port, and they are prepared to put solicitors in the field to divert the South American traffic to New Orleans. With the co-operation of the New Orleans importers who are in a position to control the coffee movement, it is expected that the northbound as well as the southbound cargoes will be sufficient to warrant regular and direct sailings.

Following a conference between representatives of the various railways and members of the Wholesale Merchants' and Manufacturers' Bureau, it was decided to appoint a general committeee, to be comprised of railway officials, importers and members of the Board of Trade and Wholesale Merchants' and Manufacturers' Bureau.

The Lamport and Holt Line has pointed out that business conditions in Brazil and Argentina are in an unsettled state, but that it is willing to establish regular sailings out of this port whenever there is sufficient tonnage to warrant such service. Inasmuch as the import and export figures of South American countries are available, the general committee will endeavor to ascertain the points of origin and distribution of commodities, in order to determine what percentage should logically move through the port of New Orleans. If the Conference Lines do not feel that this traffic justifies direct and regular service, the attention of the committee will be turned in another direction.

For example, this committee will want to know why cash registers are shipped to Colombia from Dayton, O., not by way of New Orleans, but by way of New York!

All points south and west of Lake Superior, northern Michigan and a line drawn through Indianapolis, Frankfort, Ky., and on to Charleston, S. C., are nearer to New Orleans than to New York. While distance is not the only factor in determining the direction in which traffic will move, it is one of the factors, and the proximity of the industrial centers of the central states to New Orleans will greatly assist this port in securing a large share of the South American and Pacific trade. The mileages by rail from representative Mississippi valley points to New York and New Orleans are shown in the following table:

From:	To New York.	To New Orleans.
Chicago, Ill.	912	912
Duluth, Minn.	1,340	1,337
Minneapolis, Minn.	1,332	1,297
St. Paul, Minn.	1,321	1,279
Sioux City, Ia.	1,422	1,258
Omaha, Neb.	1,402	1,070
Dubuque, Ia.	1,079	968
St. Louis, Mo.	1,058	695
Peoria, Ill.	1,006	863
Cairo, Ill.	1,089	554
Evansville, Ind.	989	708
Louisville, Ky.	867	746
Nashville, Tenn.	939	557
Denver, Colo.	1,932	1,336
Kansas City, Mo.	1,335	878

Not only is there a saving in distance from all of these points, with the exception of Chicago, but from practically all of them there is a water level grade against a mountain grade —which should have an influence on rate-making.

That the present commerce of the Latin-American countries is well worth the efforts of the New Orleans exporters and importers is shown by the following table of their annual trade with this country:

British Honduras	$1,260,573
Costa Rica	3,817,851
Guatemala	2,644,037
Honduras	2,644,037
Nicaragua	1,505,147
Panama	4,425,044
Salvador	1,519,954
Mexico	65,915,313
West Indies	213,917,713
Cuba	120,154,326
Argentina	29,847,016
Brazil	123,881,644
Chile	20,164,848
Colombia	11,219,481
Ecuador	10,124,069
Uruguay	3,231,676
Venezuela	10,657,989
Total	$627,067,653

It was recently announced that direct and regular service between New Orleans and the north coast of South America and the West Indies will be established by the United Steamship Co., with the assurance of 500-ton cargoes. A similar service will be inaugurated by the Seeberg Line to Haiti. On the whole, the prospects for better steamship service out of New Orleans to South America are excellent.

American Ship Passes Dividend

The directors of the American Ship Building Co. have decided to pass the preferred dividend for the balance of the fiscal year which ends June 30. Thereafter dividends will be paid semi-annually instead of quarterly. In a statement to the shareholders the directors stated that the net earnings of the company are sufficient to pay the 7 per cent dividend for the entire fiscal year, but that certain losses on construction on contracts taken prior to the beginning of the fiscal year have made it advisable to pass the dividend and thus begin the new fiscal year with these losses absolutely wiped out. The change from quarterly to semi-annual payments is dictated by the fact that it is impossible to determine exact profits on the business quarterly. While preferred dividends are non-cumulative, the statement seems to infer that as the dividend just passed has actually been earned, the directors may in their discretion declare it later.

An appraisal of the plants has just been made by the Manufacturers Appraisal Co. and the valuations placed on the properties are in excess of the values carried on the books. During the last six months, the liabilities of the company have been reduced approximately $725,000. The quick assets are in excess of the liabilities and the entire assets of the company, after deducting all liabilities and the book valuation of patents and good will, show a surplus in excess of the entire capitalization.

Rear Admiral Stephen B. Luce, U. S. N., retired, author of works on navigation and a consistent advocate of an American merchant marine in the over-sea trade, celebrated his eighty-seventh birthday, at Newport, R. I., recently.

The new Cunarder Aquitania will leave the yard of her builders, John Brown & Co., Clydebank, Glasgow, on May 10, for her trial trip and will sail for New York from Liverpool on May 30.

Suez Canal Statistics

The thirteen tables sent over by the Suez Canal direction are interesting reading and bear upon almost every point of the canal traffic. The following percentages show how the tonnage using the canal was distributed under the different flags:

	1913. Pr Ct	1912. Pr Ct	1911. Pr Ct
English tonnage..	60.2	63.4	64
German tonnage..	16.7	14.9	15.2
Dutch tonnage....	6.4	6.1	5.3
French tonnage...	4.7	3.9	4.5
Austro-Hungarian tonnage	4.2	4.0	3.4

Compared with 1912 the English tonnage in 1913 has decreased a little more than 3 per cent, while that of the other nationalities shows an increase. It is interesting to note that out of 297 ships in ballast no fewer than 206 were English. The number of ships having effected the total number of passages through the canal was 1,750 ships for 5,085 passages, while 316 ships went through the canal for the first time, which is about the usual proportion. The subjoined are the number of ships with special features:

1913.	1912.
15 with 3 screws	14
2 with 4 screws	—
14 with turbines	12
83 using oil fuel	64
18 with oil motors	7

The following is a list of owners according to importance of tonnage:

	1913.	1912.	1911.
	(In thousands of tons.)		
Ellerman Lines....	1,328	1,242	1,158
P. & O.....	1,285	1,212	1,205
Alfred Holt & Co.	1,162	1,015	1,003
Hansa Linie.....	1,037	880	848
Hamburg-Amerika Linie	790	695	594
Messageries Maritimes	678	583	603
Norddeutscher Lloyd	630	608	595
Rotterdamsche Lloyd	564	468	391
Nederland Stoomv. Maat	552	565	452

It will be noticed that the first three companies are English and that the following six are foreign. The largest increases in tonnage have been recorded by the Hansa Linie, 157,000 tons; Messrs. Alfred Holt & Co., 147,000 tons; and the British India, 147,000 tons.

Last year 282,235 passengers went through the canal, as compared with 266,403 in 1912 and 275,651 in 1911. The number of ships using the canal having a draught of water exceeding 26 ft. is increasing. Last year vessels of the full draught of 28 ft. made 55 passages, against 32 passages in 1912. The vessel with the greatest length was the Cleveland, of 588 ft. 9 in., while the vessel having the greatest breadth was the English cruiser Triumph, of 71 ft. 1 in., which compares with the Japanese cruiser Kurama, of 75 ft. 5 in. in width, in 1911.

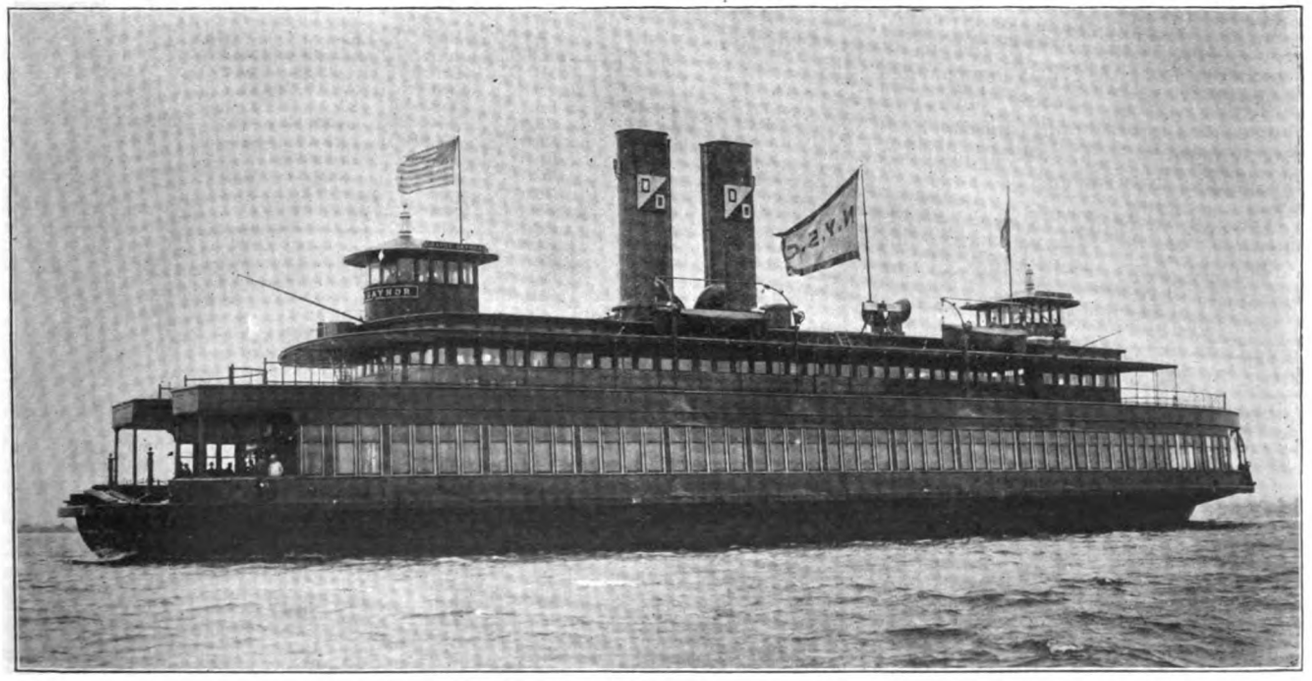
The duration of transit was exactly the same as in 1912, namely, 16 hours 19 minutes. The number of groundings in the canal exceeding three hours totaled 23 in 1913, against 13 in 1912 and 16 in 1911. The total number of groundings was 65, causing delay to 120 vessels. The Indrabarah, on Dec. 11, owing to bad weather in the Large Bitter Lake, remained fast for 117 hours 20 minutes.

The following figures show the variations in the trade of Port Said during the past three years:

	Coal Entered.	Out.
1913	1,928,000	1,638,000
1912	1,902,000	1,615,000
1911	1,996,000	1,757,000
	Oil Fuel	
1913	17,000	6,000
1912	11,000	16,000
1911	22,000	12,000

The figures for February show that the tonnage using the canal is increasing, 434 vessels, of 1,736,111 tons, traversing the canal in that month, an increase of 149,480 tons on the total for February last year, and of 44,396 tons on the figures for February, 1912. The average daily receipts of the Canal company for February appear to be the highest on record. Only 28 ships, aggregating 96,681 tons, went through the canal in February in ballast, which compares with 38 ships of 104,830 tons, in February last year and 74 ships, of 219,476 tons, in February, 1912. Up to the end of February the average time occupied in traversing the canal was 16 hours 59 minutes, or 40 minutes longer than in the corresponding periods of the two preceding years.

The wooden motor tug building at Harrisburg, Tex., for Herman H. Parsons, was designed by Wm. J. Deed Jr., naval architect, Boston. This craft will be 50 by 15 by 4½ ft. and will be equipped with a 50-H. P. automatic engine.



THE NEW FERRY BOAT MAYOR GAYNOR, BUILT BY THE NEW YORK SHIP BUILDING CO.

Tide Tables for 1915

The United States Coast and Geodetic Survey, Department of Commerce, has recently issued the General Tide Tables for the year 1915, which give in advance for that year the times and heights of high and low water at the principal ports of the United States and at a number of foreign ports.

Besides the general tide tables, published annually in advance, separate reprints are issued of the portions relating to the Atlantic and Pacific coasts of the United States. These tables are on sale at agencies in the principal seaports and may also be obtained from the office of the survey in Washington at a nominal cost, the object being to get the information in the hands of the public. Nevertheless, it does not seem to be generally known that the tide tables can be obtained in this convenient and inexpensive form.

Besides the information given for a large number of standard ports, a table is included by the use of which the predictions may be extended to a large number of subordinate stations. Tables are also given by which the height of the tide may be deduced for any time intermediate between high and low water. There are tables of the moon's meridian passage, the equation of time, the moon's phases, apogee, perigee and declination. Information is given by tables and diagrams as to the direction and velocity of tidal currents in many localities. The mean local time of sunrise and sunset is given for every degree of latitude from the equator to 68 degrees north and for every fifth day, and a table is provided by means of which the local time may be changed to standard time. Another table gives the time of beginning and end of astronomical twilight. A calendar for the year is also included.

The tide tables contain a list of the agencies for the sale of charts, tide tables, and coast pilots issued by the survey.

The laborious work involved in the prediction of tides is very much lessened by the use of a wonderful machine constructed in the office of the survey and probably the most complete of its kind in existence. This tide-predicting machine performs mechanically many of the necessary processes of computation, and does the work of 90 to 100 computers. In this ingenious mechanism, by means of a chain running over a series of pulleys adjustable to conform to particular conditions in any locality as ascertained by direct observation, effects corresponding to those of the forces causing the tides are mechanically produced and combined in such a manner as to present, both graphically in a tidal curve drawn upon a roll of paper subdivided to mark the intervals of time and numerically by means of pointers on dials forming part of the machine, the times and heights of high and low water at the station for any period in the future. The accuracy of the machine is far in excess of all that is required for producing the actual astronomical tide, but on account of meteorological conditions the mariner must expect to find more or less fluctuation from the tubular values.

The tide tables are of interest to navigators, port authorities, commercial organizations, fishermen, yachtsmen and in general to the maritime public. Information derived from them is published daily in newspapers in the principal seaport cities, and is used in many privately published almanacs and guides.

F. W. Jackson, well known around the whole chain of lakes as the marine agent of the Standard Oil Co., has perfected a storm oil anchor for use on life boats, power boats and yachts. It differs from the old sea anchor or drag in that it is equipped with a galvanized iron tank or can with an automatic feed to liberate storm oil, enabling the boat, if disabled, to heave-to and hold on until picked up. The anchor being to windward, the oil spreads about the boat and kills the combers. The anchor will be marketed by the Upson-Walton Co., Cleveland.

SUMMARY OF NAVAL CONSTRUCTION.

Name, or No. of vessel.	Contractor.	Per cent of completion. April 1, 1914. Total.	Per cent on ship.	March 1, 1914. Total.	Per cent on ship.
	BATTLESHIPS.				
New York	New York Navy Yard	99.5	99.5	98.1	97.9
Texas	Newport News S. B. Co.	*		99.0	99.0
Nevada	Fore River S. B. Co.	61.3	49.0	57.8	42.8
Oklahoma	New York S. B. Co.	65.3	61.7	63.2	58.9
Pennsylvania	Newport News S. B. Co.	23.7	16.4	19.5	12.3
39	New York Navy Yard	8.8	....	7.4	....
	DESTROYERS.				
Downes	New York S. B. Co.	95.1	95.1	94.5	94.5
Balch	Wm. Cramp & Sons	†		97.3	97.3
O'Brien	Wm. Cramp & Sons	55.1	51.4	46.6	41.5
Nicholson	Wm. Cramp & Sons	53.5	49.3	45.2	39.7
Winslow	Wm. Cramp & Sons	49.4	44.4	44.0	38.8
McDougal	Bath Iron Works	85.4	84.3	75.7	74.2
Cushing	Fore River S. B. Co.	38.1	32.5	35.1	29.6
Ericsson	New York S. B. Co.	53.7	51.5	49.8	46.6
Tucker	Fore River S. B. Co.	8.3	....	7.6	....
Conyngham	Wm. Cramp & Sons	5.4	....	4.4	....
Porter	Wm. Cramp & Sons	5.2	....	4.3	....
Wadsworth	Bath Iron Works	13.9	....	10.3	....
Jacob Jones	New York S. B. Co.	9.5	....	9.3	....
Wainwright	New York S. B. Co.	9.5	....	9.3	....
	DESTROYER TENDERS.				
Melville	New York S. B. Co.	41.5	39.7	36.5	34.4
	SUBMARINES.				
G-4 (2)	American Laurenti Co. (Phila.)	96.4	95.5	96.4	95.5
G-2 (1)	Lake T. B. Co. (Bridgeport)	89.7	89.7	89.7	89.7
G-3 (1)	Lake T. B. Co. (Bridgeport)	81.6	81.3	81.4	81.1
K-1	Electric Boat Co. (Quincy)	‡		99.2	99.2
K-3	Electric Boat Co. (San Francisco)	94.0	94.0	92.4	92.1
K-4	Electric Boat Co. (Seattle)	92.7	92.0	91.7	90.9
K-5	Electric Boat Co. (Quincy)	92.0	92.0	89.8	89.8
K-6	Electric Boat Co. (Quincy)	92.0	92.0	89.8	89.8
K-7	Electric Boat Co. (San Francisco)	86.2	84.9	85.3	84.0
K-8	Electric Boat Co. (San Francisco)	85.1	83.8	84.9	83.6
L-1	Electric Boat Co. (Quincy)	26.4	22.6	22.8	19.0
L-2	Electric Boat Co. (Quincy)	26.4	22.6	22.5	18.7
L-3	Electric Boat Co. (Quincy)	26.3	22.5	22.5	18.7
L-4	Electric Boat Co. (Quincy)	26.4	22.6	22.4	18.6
L-5	Lake T. B. Co. (Bridgeport)	7.4	4.2	7.4	4.2
L-6	Lake T. B. Co. (Long Beach, Cal.)	....	....	....	....
L-7	Lake T. B. Co. (Long Beach, Cal.)	....	....	....	....
M-1	Electric Boat Co. (Quincy)	17.8	13.7	14.1	10.3
L-8	Portsmouth, N. H., Navy Yard	....	....	....	....
L-9	Electric Boat Co. (Quincy)	....	....	....	....
L-10	Electric Boat Co. (Quincy)	....	....	....	....
	SUBMARINE TENDERS.				
Fulton	New London S. & E. B. (Quincy)	53.1	48.5	45.0	40.4
Bushnell	Seattle Constr. & D. D. Co.	28.2	....	23.2	....
	FUEL SHIPS.				
Kanawha	Mare Island Navy Yard	43.8	41.1	37.3	33.6
Maumee	Mare Island Navy Yard	24.2	18.6	20.5	14.4
	MISCELLANEOUS.				
S. B. 19 Sacramento	Wm. Cramp & Sons	92.7	92.7	86.7	84.2
Supply Ship No. 1.	Boston Navy Yard	....	....	....	....
Transport No. 1...	Philadelphia Navy Yard	....	....	....	....

(1) Contracts forfeited, vessels being completed New York yard.
(2) Conditionally delivered at Philadelphia yard, Jan. 22, 1914.
*Delivered March 12, 1914. †Delivered March 26, 1914. ‡Delivered March 17, 1914.

Vessels Under Construction

The returns compiled by Lloyds Register of Shipping, which only take into account vessels the construction of which has actually begun, show that, excluding warships, there were 535 vessels of 1,890,856 tons gross under construction in the United Kingdom at the close of the quarter ended March 31, 1914. The particulars of the vessels in question are as follows, similar details being given for the last quarter and for March 31, 1913, for the purpose of comparison:—

Description.	March 31, 1914. No.	March 31, 1914. Gross tonnage.	Dec. 31, 1913. No.	Dec. 31, 1913. Gross tonnage.	March 31, 1913. No.	March 31, 1913. Gross tonnage.
Steam:—						
Steel	497	1,884,735	485	1,952,648	512	2,055,433
Iron	...	.....	...	.....	...	.....
Wood and composite	6	211	5	166	6	340
Total	503	1,884,946	490	1,952,814	518	2,055,773
Sail:—						
Steel	18	5,440	13	3,599	19	7,275
Iron	1	270	..	.....	..	.....
Wood and composite	13	200	10	193	26	646
Total	32	5,910	23	3,792	45	7,921
Total steam and sail	535	1,890,856	513	1,956,606	563	2,063,694

The tonnage now under construction is about 66,000 tons less than that which was in hand at the end of last quarter, and nearly 173,000 tons less than that building in March, 1913.

Of the vessels under construction in the United Kingdom at the end of March, 421 of 1,482,380 tons are under the inspection of the surveyors of Lloyds Register with a view to classification by this society. In addition, 124 vessels of 518,854 tons are building in other countries under the society's survey.

There are thus now building under the supervision of Lloyd's Register 545 vessels of 2,001,234 tons. The details are as follows:

	No.	Gross tonnage.
Building in United Kingdom for home account, for sale, etc	335	1,141,286
Building in United Kingdom for other countries	86	341,094
Building abroad for United Kingdom owners	7	29,410
Building abroad for other countries	117	489,444
Total building on March 31, for classification with Lloyds register	545	2,001,234

Oxygen Production in the United States

In the absence of any reliable data on the quantity of oxygen produced in the United States, the current estimate of the daily production is around 600,000 cu. ft. Of this quantity approximately one-half is supplied by twelve central stations situated in different parts of the country; the rest by plants in individual works. The majority of these central stations are operated by the Linde Air Products Co., using the well-known Linde liquid air method.

There are several electrolytic works of which the largest are operated by the International Oxygen Co., Newark, N. J., and Oxyhydric Co., Milwaukee, Wis., Dayton Oxygen & Hydrogen Co., Dayton, O.

The International Oxygen Co. has installed a considerable number of plants under their system for individual users; besides these there are a great many oxygen equipments making gas by the Brinn process and by the Chlorate of Potash method.

As to the quality of the gas, the electrolytic oxygen naturally stands highest; it is very much in demand for fine welding and cutting. This latter branch is being rapidly developed in this country, particularly in combination with hydrogen. The large steel and electric companies make considerable use of oxy-hydrogen. The railroads, however, who are such large factors in the use of oxygen in Europe, have not yet adopted this method on any large scale in this country. The Union Pacific railroad and the Illinois Central railroad are perhaps the largest users of the autogenous method among railroads.

The United States government uses considerable oxygen and hydrogen in the different navy yards; but on the whole the ship builders are just beginning to apply the welding and cutting torch in their yards.

Some fine welding is being done in the United States in some instances very intricate jobs are carried out by this method. There is a lack, however, of well instructed welders. The art is so young that there has not yet been formed a large contingent of experienced workers.

An association has been recently organized among the compressed gas manufacturers under the title of "Compressed Gas Manufacturers' Association" with headquarters in New York. Dr. Hugo Lieber, of the Blau-

The aim of this association is to further the interest of the compressed gas industry in this country, as well as standardizing methods.

Items of Interest

Robert J. Noble has been appointed general representative of the King Paint Mfg. Co., Brooklyn, N. Y., with headquarters at 80 Broad street.

Rear Admiral Francis T. Bowles has resigned as president of the Fore River Shipbuilding Corporation. His successor has not yet been chosen.

Bids for constructing the steel seagoing hydraulic dredge San Pablo will be received at the United States engineer's office, San Francisco, until June 18.

W. C. Richardson, of Cleveland, has taken over the steamer Roumania from the Richardson Transportation Co., and the Richardson Transportation Co. has been dissolved.

The Racine Boat Mfg. Co., Muskegon, Wis., launched the government survey steamer Paquippe, on April 11. She is 85 ft. long, 15 ft. beam and is intended for Atlantic coast service.

Charles O. Jenkins has resigned as the manager of the Jenkins Steamship Co.'s fleet and the four vessels of the fleet will be operated by Hutchinson & Co., Cleveland.

Capt. R. W. Kennedy, marine superintendent on the Pacific coast for Andrew Weir & Co., has moved his headquarters from Seattle to Los Angeles.

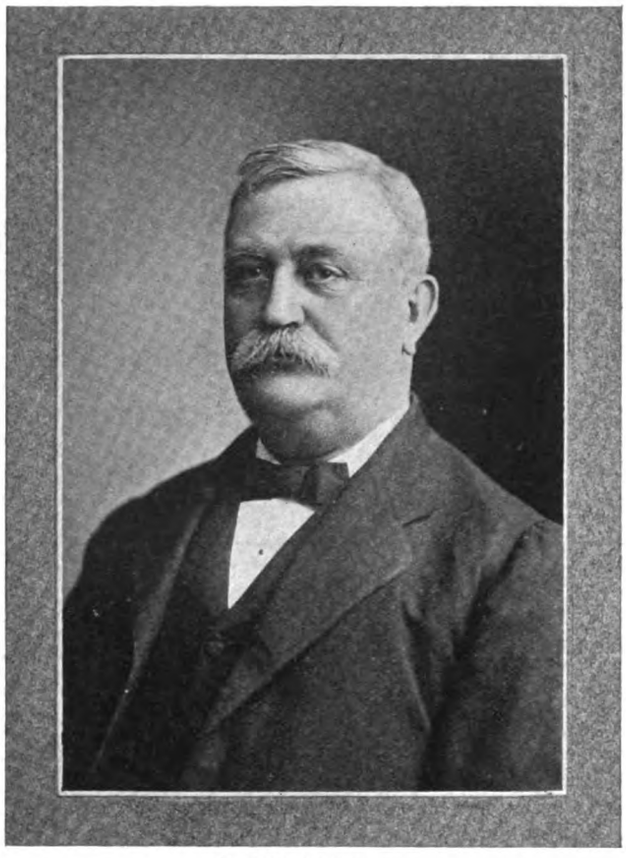
B. W. Greer has been appointed agent for British Columbia for the Maple Leaf line of steamers, which ply between New York and Vancouver. His headquarters will be Vancouver.

The Richardson-Phenix Co., Milwaukee, Wis., has issued a catalog descriptive of the Phenix sight flow indicator which is a device for inserting in pipe lines, showing at a glance or indicating electrically whether or not the liquid is flowing in the pipe.

E. F. Platt, formerly connected with the Platt Iron Works, of this city, and C. A. Kurz Jr., of the Kurz Laboratories, have recently organized the Electrolytic Gas Co. This company has secured the western selling agency of the International Oxygen Co., of New York, and it is the intention of the company to proceed with the installation of a number of electrolytic plants of the I. O. C. system for the production of oxygen and hydrogen in different parts of the country. Both Messrs. Platt and Kurz are well known in the mechanical and metallurgical line throughout the country, and the success of the new company is, therefore, assured.

Death of Alfred Noble

Alfred Noble, chief engineer of the Pennsylvania Tunnel & Terminal railroad and a former president of the American Society of Civil Engineers, died April 19 at St. Luke's hospital, in New York City. Mr. Noble was born in Michigan, Aug. 7, 1844, the son of Charles and Lovina Noble. He served three years in the Army of the Potomac. He was graduated from the University of Michigan in 1870 as a civil engineer, and for the next 12 years was in charge of improvements in the St. Mary's Falls canal and St. Mary's river. From 1883 to 1886 he was general assistant engineer of the Northern Pacific railway, and for some years after that was in charge of the construction of railroad bridges in various parts of the country. Mr. Noble was a member of the Nicaraugua canal board in 1895, of the United States board of engineers on deep waterways in 1899 and 1900, of the Isthmian Canal Commission from 1899 to 1903, of the Board of Consulting Engineers of the Panama canal in 1905, and was chief engineer of the East River division of the Pennsylvania, New York & Long Island railroad and successor from 1902 to 1907. This company and the Pennsylvania, New Jersey & New York railroad, in 1907, became the Pennsylvania Tunnel & Terminal railroad, organized to build the electric division of the Pennsylvania railroad including the tunnels under the Hudson river. For his work at this time Mr. Noble received the John Fritz medal. In May, 1912, he received the Eliott Cresson medal from Franklin Institute at Philadelphia. He was president of the American Society of Civil Engineers in 1903, and of the Western Society of Engineers in 1897.



ALFRED NOBLE

The steamship Advance, of the Panama Railroad Steamship Line, one of the finest little sea-boats in Atlantic service, now laid up at New York for repairs to its hull, is to be converted into a freight vessel for carrying explosives. A completely insulated magazine of 300 tons capacity will be installed, at a cost of about $10,500. The vessel will not carry passengers and will be operated otherwise in accordance with the regulations of the Department of Commerce and Labor with regard to the transportation of explosives. It will be operated on an independent "wild cat" schedule, making such calls as are required by its new service. In addition to its cargoes of explosives, it will carry as ballast on both outward and homeward voyages such freight as will stand the delays incident to its principal service.

The Manitowoc Ship Building & Dry Dock Co. launched the tug Alice Stafford for the Chicago terminal service of the Erie railroad, last month. The tug, which was built from designs by Babcock & Penton, New York and Cleveland, is 120 ft. in length, 28 ft. beam and 14 ft. 9 in. deep, and is practically a duplicate of the Albert J. Stone, which was described in the April issue.

The tug Timothy J. O'Byrne was also launched the same day for the Chicago Park Commission.

Steam Yacht Galatea

A new steam yacht built for E. L. Ford, of Detroit, was launched at Wilmington, Del., April 4, and named the Galatea. Designed by William Gardner & Co., of New York, she is schooner rigged and of the following dimensions: Length over all, 192 ft.; length, water line, 157 ft.; beam, 24 ft., and draught, 10 ft. 6 in. The hull is heavily constructed of high tensile steel, with six watertight bulkheads, dividing her into five compartments. The two midship ones contain the machinery and coal. The after one is given up entirely for owner's and guests' quarters and the two forward ones for crew space. The propelling power consists of a triple-expansion engine and two water-tube boilers, designed for 12 knots, normal speed, and 14 knots under forced draft. The coal bunkers are of sufficient capacity to give the yacht a cruising radius of 2,500 nautical miles without recoaling. A refrigerating plant for cold storage is fitted.

Cape Cod Canal

The $12,000,000 canal being built at Cape Cod, Massachusetts, will be opened for the passage of light-draught vessels in July, according to report. The people of the cape are already making plans for a marine and land pageant to celebrate the opening. The question of whether a bridge or ferry should be selected at Bournedale is now about the only feature over which there is any dispute. The canal company, it is reported, is desirous of installing a ferry, whereas citizens of the cape towns want a bridge. The matter is being arbitrated before the state public service and harbor and land commissions.

Contract has been awarded to Vancouver Island lumber firms to deliver to the order of the Dominion government at Toronto 24,000,000 ft. of timber to be used in the construction of the new harbor works at that city. Delivery must be completed within four years. A contract of this size is considered large in the lumber business, and the fact that it is the first contract to be placed as a direct result of the opening of the Panama canal in the current year is taken as an earnest of the vastly increased trade for Vancouver Island to follow from that event.

James C. H. Ferguson has been appointed Pacific coast representative of Cramps, Philadelphia. He was formerly with the Midvale Steel Co.

Our National Resources

By F. Horton Colcock*

The organization of the National Rivers and Harbors Congress was for the distinct and specific purpose of bringing to bear the whole influence of the country upon the National congress for the purpose of as far as possible utilizing for all economic national purposes the natural water resources with which nature has endowed this wonderful country. Its object is so far reaching that it would be impossible in a short article to even begin to show the objects towards which it is looking in the betterment of our nation.

It is non-political, non-sectional, and entirely free from any ulterior motive or any desire whatsoever to advocate in any way special projects. It is composed of a body of men who desire to see the natural resources of this great country in the way of water transportation developed to its utmost capacity so that the great tribute that is now paid by the ordinary producer to vast, largely capitalized companies for the purpose of transportation will be eliminated as far as possible. We desire to have the wealth producing population of this country brought into as close and intimate relation as is possible with the consumers from whom the ultimate profit is realized. We hold that transportation profits are only incidental and that it is the duty of every nation to eliminate them as far as is consistent with a proper respect for vested capital. We believe that water transportation is the cheapest transportation, the most natural transportation and in the end the most intimate transportation between producer and consumer.

The National Rivers and Harbors Congress has no fight whatsoever upon the development, private or national, of railroad facilities. It does hold, however, that all the capital of this great country is totally insufficient to develop railroad facilities to that extent which will bring about the greatest development of this wonderful country.

No special project under any circumstances would be for a moment allowed to be discussed in this congress, however wide its territorial advantages. It's the nation and the nation alone and its welfare as a whole that this congress is trying to influence the National congress to place upon its strongest and best foundations for the future good.

The congress desires especially that all army engineers shall realize that in acting upon any project whatsoever they are deciding for a permanent feature of improvement and that once their special policy shall have been adopted that the government will feel that it has only been done after conservative, and interested consideration for the future of this nation and that they will thereafter be supported in carrying that special policy to its ultimate conclusion. It wishes to eliminate as far as possible any contest between individual projects except in so far as to convince whom they regard as the non-partizan, non-sectional court of arbiters of the best good that will result to the nation as a whole. The great curse in the past to harbor and river improvement has been the influence brought from time to time upon political parties for special projects. This has rendered the schemes for individual improvement when brought before the engineers in charge a matter of grave and serious consideration since they could never tell to what extent they would be supported in a continuing project. Let us trust our engineers and feel that they are national and loyal and patriotic and decide only upon such schemes as can be completed and reject such as the nation's wealth does not justify. Let go by the day when the effort of every senator and congressman shall be to get the most that he can for his own constituents independent of the best interests of the nation at large. In other words, let us be a nation and let every one of us be willing to sacrifice any pet theories or expected benefits for our nationalism.

The time has come when this nation which has now become a world power should put itself in a position to compete with any other world power. There is no room in this article for me to more than outline that for which this organization stands. The by-products, if I may so style them, of such an organization are nationalism, patriotism and unity. All sections of the country coming together by the representation of their ablest citizenship produce an influence which is bound eventually to unify the people as a whole. And it is remarkable to see how independent of all political differences or the ruling administrations this congress is a unit for everything that tends to better the nation. It stands for everything national and nothing sectional.

*Director, National Rivers and Harbors Congress, Columbia. S. C.

The head office of the Farrar Transportation Co., operating the steamships Collingwood and Meaford on the great lakes, has been moved from Collingwood to Toronto.

Action of Sea Water on Concrete

Tests made by the Aberthaw Construction Co., of Boston, beginning in 1909, to study chemical action and frost action on reinforced concrete in sea water, seem to indicate that with proper mix and proper care, piers and other structures can be made to withstand such disintegrating influences. Twenty-four piers, 16 ft. long by 16 in. square, built by the Aberthaw Construction Co. in the Charlestown navy yard, have been subjected to tidal rise and fall in that yard for five years. They were placed with 18 in. out of water at high tide and 4½ ft. under water at low tide, the mean tide being 10 ft.

In general, the richer the specimen in cement, the better does it stand the test. The one pier of the whole 24 which was eaten all the way through, was one of the leanest specimens tested, consisting of one part cement, three of sand and six of stone, cast quite dry. This specimen was eaten entirely through at about 3½ ft. above low water. About one foot in the length of the specimen was entirely gone, but the reinforcing bars held the pieces together. The back side was eaten away on a slant for a distance of nearly 10 ft., but the specimen was only very slightly affected below the low water line. At the eaten section the material was dead and particles could be picked off the surface with the finger nail.

As a contrast, a pier mixed from one part cement, one sand and two of stone, and cast very wet, shows a splendid condition, even after five years of treatment. This specimen when cast was soft enough so that the concrete would run out of an overturned wheelbarrow, but it would not flow like syrup.

When examined in March, 1910, this pier was apparently in as good condition as when placed. At the recent examination the face and back was slightly pitted, but the edges and sides were perfectly good and the back showed very slight action.

The Newport News Ship Building & Dry Dock Co., Newport News, Va., has received contract from the Crowell & Thurlow Steamship Co. for a freight steamer to cost about $400,000 and to be 375 ft. long.

Fred W. Green and Philip S. Jaeger have formed the Green-Jaeger Co., to carry on a general marine brokerage business with offices at 1502 Rockefeller building.

Converted Into Oil Tanks

Perhaps no better illustration of the demand for oil tankers on the Pacific can be cited than the recent conversion of the splendid four-masted American bark Erskine M. Phelps into a bulk carrier. Unlike several other sailing vessels which in recent years have been turned into oil carriers, the Phelps still retains her lofty spars and graceful yards and is still capable of using the ocean winds as a means of propulsion. The Phelps is the first full-rigged sailing ship to be impressed into the oil-carrying business on the north Pacific. The ambitious plans of the new owners are being followed with some interest as the advisability of using a large full-rigged ship like the Phelps in the coastwise oil trade is largely experimental.

Although 15 years old, having been launched at Bath, Me., in 1898, the Phelps was kept in such splendid condition that she brought an unusually high price when the Union Oil Co. of California purchased her early this year. Of course the Phelps is one of the finest steel ships of her type ever built at an American yard, incidentally being one of the first steel sailers launched in the United States.

Originally it was intended to take down the vessel's yards, topgallant and topmasts, but after careful consideration it was determined in view of her excellent average as a sailer to keep her rigged as a full-rigged ship. It was figured that she might make from eight to ten round trips annually from Californian oil ports to the Hawaiian Islands and thus save the expense of towage. On her first voyage from Port San Luis to Honolulu and return, the vessel, under her own sail, made the distance out and back in 43 days under conditions not the best for sailing. The Phelps is now making several coastwise voyages from California to Puget Sound under tow, but later she will operate under her own sail. It is yet too early to know whether the Phelps will be an entire success, but there is every indication that she will justify the expectations of her new owners.

The Phelps is a four-masted skysail bark of 2,682 net tons, of the following dimensions: Length, 312 ft.; beam, 45 ft.; depth, 28 ft. Her masts are unusually lofty and her yards of great length. The ship is so well molded that she has been handled in port without ballast. This, however, caused some worry, as it was feared that when carrying oil she would be so stiff as to cause uneasiness for her rigging. To overcome these fears she was heeled and the continuous expansion trunks considerably widened so as to leave a large free surface on the oil cargo to ease the rolling of the ship.

The work was done by the Union Iron Works, San Francisco, in what is considered record time. So rapidly was the overhauling done that the Phelps was delivered 20 days in advance, the contractors earning a bonus of $2,000 thereby. Several steel athwartships oil-tight bulkheads and one longitudinal bulkhead, at center line, were built in the 'tween decks, with oil-tight trunks extending up through the main deck from each tank. The frames were cut and bracketed at the lower deck. Under the severe hydrostatic tests of the bulkheads very few leaks were developed and the contract was done to the great satisfaction of the owners. The vessel's total oil capacity is 28,500 barrels.

A complete pumping and machinery outfit was installed. In the 'tween decks, immediately forward of the break of the poop, two single furnace Scotch boilers, 8 ft. 6 in. in diameter, and 10 ft. 6 in. long, were placed. The ship's donkey boiler was overhauled and connected with the steam pipes throughout. In the boiler room was fitted a condenser with combined air and circulating pump. The Dahl system of oil burners was installed in the boilers and also under the donkey boiler. The main cargo pump is a Worthington duplex outside packed piston pump, 14 in. by 18 in. by 20 in., drawing from a 10-in. suction line with connections to each tank and the forehold. This pump is located in the after hold with the bilge pump. An 8-in. line with reducers for connecting 6-in. hose was installed for the discharge line. So as not to interfere with the working of the ship on deck the discharge pipe was run fore and aft through the tanks with risers fore, aft and amidships.

For ship's use, oil fuel is carried in a large rectangular tank built into the square of the main hatch and standing 6 ft. above the main deck. Its capacity is 210 barrels. The entire system of oil burning, piping, pumping and spraying was found to work economically and satisfactorily. The ship's mooring facilities were increased by securely bolting to the deck nine, heavy 14-in. bollards.

In installing the Marconi wireless, the aerial was led from the main mast past the mizzen to the jigger and thence down the back stays to the wireless room on the poop. A large house was built over one of the old cargo hatches and fitted for the double purpose of messroom and smoking room for the men. The galley was also overhauled. The deck officers were berthed aft in the cabin while the engineers and petty officers are now housed in the midships house. The ship's old main pumps at the main mast were discarded and the fresh water tanks installed near the boilers after being moved aft. Altogether the Phelps is admirably adapted for carrying oil in bulk. There are several hulks employed on this coast in the oil trade as well as a number of barges, but the Phelps is the only bulk carrier still under her own sail.

During her 15 years as a cargo carrier to all parts of the world the Phelps has proudly maintained the Stars and Stripes and kept her reputation as one of the smartest sailers afloat. She has made several runs from Honolulu and the north Pacific to Delaware breakwater in from 104 to 110 days, once having sailed from Kahului to Philadelphia in 98 days, and again from Honolulu to Philadelphia in 100 days. Again she made a world's record of 58 days from Java to Taltal. Other notable sailing feats credited to this fine ship are: Norfolk to Honolulu, 97 days; Philadelphia to Manila, 102 days; Manila to Honolulu, 64 days against strong northeast monsoon; Manila to Honolulu, 42 days, also a world's record; Seattle to Norfolk, 104 days; San Francisco to Kahului, 13 days. These are but a few of the splendid sailing records held by this vessel which hereafter will operate in the Pacific oil trade.

Heating Qualities of Sugar

According to Sir Ernest Shackelton, who certainly should be authority on everything connected with cold weather, sugar is far better than alcohol to keep the frost away. In a recent interview, he said, "There was an occasion when we marched 321 miles, drawing laden sledges, in 14½ days. Every two hours, we took two or three lumps of sugar each. Within ten minutes of eating this we could feel the heat going through our bodies. The highest temperature of that march was 62 degrees below zero." Every one knows, of course, that sugar is rich in calories, that is, heat units. But that it acts so very promptly in heating up the body—so much like wood in a stove—will be news, we fancy, to the laity of the temperate regions.

A. A. Raven, president of the Atlantic Mutual Insurance Co., sailed from New York on April 15 on a Mediterranean cruise.